# Valorisation of sustainability-related criteria in commercial real estate

Yona Kamelgarn

**UNIVERSITE PARIS-DAUPHINE**

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DRM-CEREG

# Valorisation des critères de durabilité des actifs immobiliers tertiaires

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**Yona KAMELGARN**

## COMPOSITION DU JURY

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|---|---|
| **Directeur de thèse:** | **Arnaud SIMON**, Maitre de conférences HDR, Université Paris-Dauphine |
| **Rapporteurs :** | **Andrée DE SERRES**, Professeure, Université du Québec à Montréal |
| | **Thomas LÜTZKENDORF**, Professeur, University of Karlsruhe |
| **Suffragants:** | **André SOBCZAK**, Professeur, Audencia Ecole de Management |
| | **Dominique BLANC**, Directeur de la recherche, Novethic |

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## DOCTORAL DISSERTATION

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| **Reviewer :** | **Andrée DE SERRES**, Professor, Université du Québec à Montréal |
| | **Thomas LÜTZKENDORF**, Professor, University of Karlsruhe |
| **Suffragan:** | **André SOBCZAK**, Professor, Audencia School of Management |
| | **Dominique BLANC**, Head of Research, Novethic |

# Warnings

*This thesis was conducted within the framework of a French contract (CIFRE) between Paris-Dauphine University and the company Novethic.*

*The views expressed in this dissertation are those of the author, and do not necessarily reflect the positions of Paris-Dauphine University and Novethic.*

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# Avertissements

*Cette thèse a été réalisée dans le cadre d'une Convention Industrielle de Formation par la Recherche (CIFRE) entre l'Université Paris-Dauphine et la société Novethic.*

*Les opinions exprimées dans cette thèse sont celles de l'auteur, et ne reflètent pas nécessairement les positions de l'Université Paris-Dauphine et de Novethic.*

# Abstract

In relations with the rising concerns on sustainable development and Corporate Social Responsibility (CSR), sustainability-related topics have become a key trend in the real estate sector. This dissertation examines sustainable real estate, and investigates more particularly the value it holds for various stakeholders. Each of the five chapters focuses on different market players to analyse how sustainability-related topics are perceived, and the extent to which these perceptions shape practices. Chapter 1 questions the notion of value associated with sustainability-related features at a building level. Chapter 2 examines the value creation strategies associated with sustainability-related topics at corporate level. Chapters 3 and 4 focus respectively on the diffusion of sustainability certification schemes, and occupiers' perceptions of their brand value. Chapter 5 explores the impacts of sustainability-related trends on the long term management of the building stock.

**Keywords**: Real Estate, Value, Sustainability, Corporate Social Responsibility (CSR), Eco-labels, Responsible Investment, Obsolescence.

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# Résumé

En lien avec l'essor du développement durable et de la Responsabilité Sociale des Entreprises (RSE), les enjeux de durabilité sont devenus une tendance forte du secteur immobilier. Cette thèse examine l'immobilier durable et explore la valeur que diverses parties prenantes y associent. Chacun des cinq chapitres se concentre sur différents acteurs pour étudier leurs perceptions de l'immobilier durable et la manière dont elles façonnent leurs pratiques. Le premier chapitre questionne le concept de valeur associée aux bâtiments durables. Le second chapitre examine les stratégies de création de valeur liées à l'immobilier durable à l'échelle des foncières. Les troisième et quatrième chapitres portent respectivement sur la diffusion des certifications environnementales et leur valeur de marque pour les entreprises utilisatrices. Le cinquième chapitre explore l'impact des préoccupations croissantes liées au développement durable sur la gestion de long terme du stock de bâtiments existants.

**Mots-clés** : Immobilier, Valeur, Durabilité, Responsabilité Sociale des Entreprises (RSE), Ecolabels, Investissement responsable, Obsolescence.

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| BIM | Building Information Modelling |
| BREEAM | Building Research Establishment Environmental Assessment Method |
| CSR | Corporate Social Responsibility |
| DCF | Discounted Cash Flow |
| DGNB | Deutsche Gesellschaft für Nachhaltiges Bauen (German certification) |
| EPBD | Energy Performance of Buildings Directive |
| EPC | Energy Performance Certificate |
| ESG | Environmental, Social and Governance |
| GRI | Global Reporting Initiative |
| HQE | Haute Qualité Environnementale (French certification) |
| LEED | Leadership in Energy and Environment Design |
| PRI | Principles for Responsible Investment |
| RICS | Royal Institution of Chartered Surveyors |
| RI | Responsible Investment |
| RPI | Responsible Property Investment |
| UNEP FI | United Nations Environment Programme Finance Initiative |
| WGBC | World Green Building Council |

# GENERAL INTRODUCTION

In relations with the rising concerns on sustainable development and the institutionalisation of Corporate Social Responsibility (CSR), sustainability has become a key trend in the real estate sector. This dissertation thesis takes "sustainable real estate" as a research object and investigates more particularly the value it holds for the various stakeholders and ultimately for real estate investors. It focuses on commercial real estate, in particular office buildings. Empirical evidence is mainly drawn from the French and European contexts, although key results seem applicable to other mature real estate markets.

## 1. Background on sustainable real estate

### 1.1. Sustainable real estate and the sustainability agenda

There is no agreed upon definition of sustainable real estate (Berardi, 2013). In a broad sense, sustainable real estate may be defined as real estate practices that contribute to sustainable development (Lützkendorf and Lorenz, 2005). However, this sustainability objective should not be implemented to the detriment of social utility of buildings, i.e. providing functional and comfortable spaces to its occupants. In its definition, the international standard ISO 15392:2008 clearly emphasises this point, stating[1]: "*Applying the concept of sustainability to specific buildings or other construction works includes an holistic approach, bringing together the global concerns and goals of sustainable development and the demands and requirements in terms of product functionality, efficiency and economy.*" This definition relates to the purpose of sustainable real estate, without specifying the means to achieve sustainability objectives (technological innovations, change in the behaviours pattern, more responsible construction practices, etc.). Each stakeholder of the construction and real estate sector will hold different perceptions and will implement different solutions to help sustainable development move forward.

The question that remains is to what extent market players will be up to the task, and deliver the level of sustainability required. Cole (2011) states it will require motivating stakeholders directly and indirectly, and more globally "*changing the context in which buildings are developed, designed and operated, and by implication, the role that various stakeholders play within this process*" (Cole, 2011, p.432). To this end, professional bodies such as the World GBC have promoted the business case of sustainable buildings. They investigate the benefits of sustainable real estate for the various stakeholders of the construction and real estate sector, stating: "*We need the right data to spur better financial decision-making*" (WGBC, 2013, p.10). Understanding the value sustainable real estate hold for the various stakeholders appears paramount to foster sustainability in real estate.

[1] ISO 15392:2008. Sustainability in building construction -- General principles. Available at : https://www.iso.org/obp/ui/#iso:std:iso:15392:ed-1:v1:en

## 1.2. Real estate market players

In order to investigate sustainable real estate, it is first important to understand the way real estate markets are organised and the role of the various market players and stakeholders.

Real estate is composed of two closely linked markets: a space market and an asset market (Geltner *et al.,* 2010). In the space market, tenants rent spaces supplied by property owners. Rental prices depend on property location, type and characteristics. For office buildings, tenants are companies seeking office spaces for their activities and their employees. The level of demand thus varies according to the level of economic activities. In the asset market, investors are competing for property assets. Real estate is thus treated as an investment asset class, on the same terms as equities or bonds. Asset prices are related to the cash flows investors may anticipate from the holding of the asset. In addition, the supply and demand of spaces will be impacted by the development industry, which provides new and refurbished spaces. Developers are intermediaries who act usually on behalf of identified or prospective investors in contracting with construction companies. **Figure 1** illustrates the various interactions between the real estate markets.

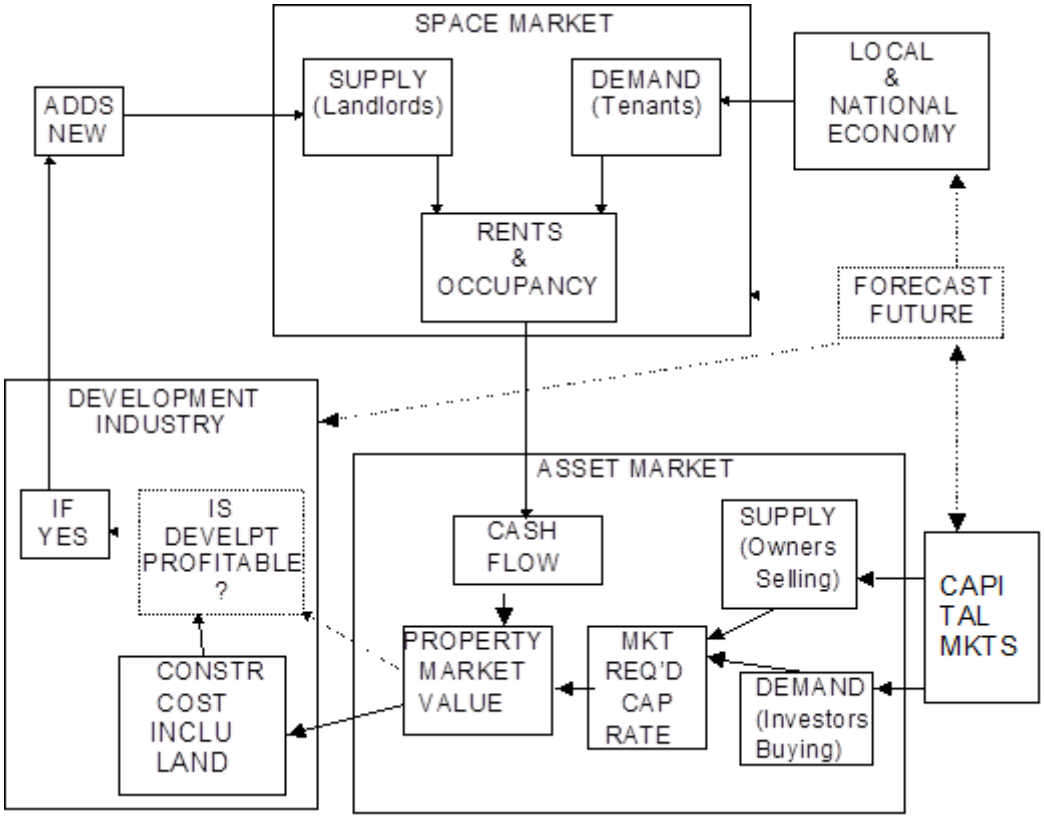


**Figure 1: The "Real Estate System": Interaction of the Space Market, Asset Market & Development Industry (source: Geltner *et al.*, 2010)**

In addition to these core market players, other agents also play a role in the construction and real estate sector. Investors and developers are in relations with other financial players, such as the banks who provide lending to their projects, and insurance companies. Financial and legal advisors as well

as valuers usually called on in market transactions. The operation of buildings usually involves property managers, in charge of daily operations, and facility managers in charge of utilities and maintenance. In addition, government and local authorities frame the legal context in which all these market players operate.

These market players do not form homogeneous groups. They may have different drivers and motivations and should be differentiated to understand their perceptions of sustainability (Lützkendorf *et al.,* 2011). In particular, different types of investors should be distinguished. Institutional investors (pension funds, insurance companies, etc.) and retail investors may invest directly or indirectly in real estate. Indirect investment involves investment in listed companies specialised in real estate (mostly REITs in France), and investment in unlisted funds (such as OPCI and SCPI in France) managed by asset managers. These various investors hold a key role in the development of sustainable real estate, since ultimately they are directly or indirectly responsible for the development, the management and the refurbishment of buildings.

## 1.3. Sustainability in real estate practices

Sustainability-related features in real estate are not a new development. Energy, in particular heating power, has long been a standing issue due to building codes. For instance, in France, energy topics have been included in the building code since 1974. However, sustainability-related issues used to be focused on a limited number of technical environmental concerns, with little impact on the organisation of the sector. In the last fifteen years or so, increased attention has been paid to sustainability issues from the various market players. Nappi-Choulet (2010) describes this trend as a transformation comparable to that resulting from the "financialization" of real estate. Nelson *et al. (2010)* suggest that sustainability has become mainstream in real estate. It is no longer confined to dedicated technical teams, and affects relations between market players.

### *At building level*

At building level, regulation has been a key driver of this shift. Historically, regulatory schemes have focused on the reduction of energy use for new buildings and retrofits. In the last ten years, French building codes reduced energy consumption of new buildings by three. And this trend is still ongoing since European regulations[2] aims for all new buildings to be nearly zero energy by 2020. To prepare the market for these regulation reinforcements, energy labels such HPE (High Energy Performance) and BBC (Low Consumption Building) in France, were developed for buildings consuming respectively less than 10% and 50% of the minimum requirements in the energy regulation for buildings. In addition, the disclosure of energy performance certificates (EPCs) has become mandatory during sale and rental transactions.

However, sustainability-related features in buildings cannot be reduced to energy issues. They also encompass environmental, health and social topics throughout buildings life cycles from their

[2]The two main European directives as regards energy consumption in buildings are the 2010 Energy Performance of Buildings Directive (EPBD), and the 2012 Energy Efficiency Directive. They require member countries to set minimum energy performance requirements for new buildings and renovations.

construction to their life in use and eventually their demolition and recycling. Voluntary certification schemes have provided frameworks to address a wider range of issues beyond energy performance.

Since 1990, numerous certifications schemes have emerged worldwide (see Cole (2005) for further details), including BREEAM in the UK, LEED in North America, DGNB in Germany, HQE in France, etc. In the French market, the HQE is the widest spread. Since the launch of the certification in 2005[3], the number of certified office buildings has rapidly increased among French new developments. Seven years later, it had become a market standard for new offices buildings in the Greater Paris region. In 2012, three fourths of the supply of new office spaces were certified (DTZ-Novethic, 2013). Initially, these certification schemes were mostly elaborated for construction stage. More recently, certification bodies have elaborated in-use labels dedicated to the operation stage of buildings: BOMA BESt® in Canada, BREEAM In-Use in the UK, LEED E-BOM in the US, HQE Exploitation in France, etc. In addition to certification schemes, less formal systems have also been developed, such as GreenRating®, CarbonScreen®, etc. These tools have been used in particular by investors and owners to assess and compare the performance of several buildings within their portfolios.

### *At organisation level*

On a broader level, Corporate Social Responsibility and Responsible Investment contribute to shaping the integration of sustainability-related concerns by organisations. Corporate Social Responsibility refers to the responsibility of companies/organisations towards society. In its revised definition, the European Commission thus explains:

"*To fully meet their corporate social responsibility, enterprises should have in place a process to integrate social, environmental, ethical, human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders, with the aim of:*

- *maximising the creation of shared value for their owners/shareholders and for their other stakeholders and society at large;*
- *identifying, preventing and mitigating their possible adverse impacts*."

(European Commission, 2011, p.6)

Responsible Investment (RI) relates to investors' practices. It can be defined as the integration of environmental, social and governance (ESG) criteria into investment decision-making process. Initiated in listed equities, these practices have gradually extended to all asset classes. They are promoted in the Principles for Responsible Investment (PRI), an international organisation where asset owners and asset managers commit to integrate ESG criteria into their investment process and report on their practices.

Over the last few years, CSR and RI have widely spread. The institutional context has generated a strong normative call for responsible behaviours (Campbell, 2007). This context comprises international norms and standards (e.g. OECD Principles, UN Guiding Principles on Business and Human Right, etc.); public regulation in particular as regards non-financial disclosure for listed and/or large companies; pressure of NGOs; presence of non-financial rating agencies monitoring companies; international associations promoting responsible practices (e.g. Global Compact, PRI, UNEP Finance Initiative, etc.); labels and certification schemes; etc. (see Capron and Quairel-Lanoizelée (2010) for further details).

[3] The approach was created in 1996. However, it only became a certification scheme in 2005.

These trends have not left aside the various market players of the construction and real estate sector: construction companies, developers, real estate owners and investors, companies renting office spaces, etc. Professional bodies including the RICS for real estate professionals, EPRA for listed real estate companies, INREV for unlisted real estate funds, UNEP FI for investors, etc. have developed working groups, guidance notes and publications dedicated to sustainability-related topics. Simultaneously, organisations specially aiming the promotion of sustainable practices have been created, such as the World Green Building Council and its national branches, the international benchmarking platform GRESB (Global Real Estate Sustainability Benchmark) or the Observatoire de l'Immobilier Durable in France.

## 2. Research motivation

The construction and real estate sector is considered as paramount for the global sustainability agenda. In particular, it has been pointed out as the sector where the climate change mitigation measures are the most cost-efficient (EEFIG, 2015). In France, the sector is responsible of 43% of final national energy consumption, 25% of greenhouse gas emissions, 16% of water consumption and 40% of waste production.[4] In addition to these environmental issues, the real estate and construction sector is also fraught with social and governance challenges. The real estate sector contributes to urban development. It participates to the shaping of cities and to the environment in which communities live. In this respect, buildings are associated with health and comfort conditions for its occupiers. In addition, the construction sector is largely exposed to bribery, conflicts of interests, and moonlighting.[5]

To meet the sustainability-related challenges, true shifts are required in the sector (Du Plessis and Cole, 2011). In addition to regulatory instruments, it has been argued that market-based mechanisms could help the transformation. In particular, the business case of sustainable real estate and more broadly of CSR have been seen as key to pave the way for more responsible practices (Carroll and Shabana, 2010). Indeed, market players who understand the benefits of sustainable practices (or risks associated with non-sustainable practices) would voluntarily integrate more sustainability–related features into their decisions. Highlighting the value of sustainable real estate and improving decisions tools to more fully account for sustainability has thus been fostered to promote the sustainability agenda (Lorenz and Lützkendorf, 2011).

This thesis contributes to these topics by investigating the value of sustainable real estate for various market stakeholders. It aims to examine the perceptions of the benefits associated with sustainable real estate, and their impacts on practices. Ultimately, it questions the limits of the existing attempts to value sustainability as regards the initial objective of promotion of the sustainability agenda.

[4] CSTB/UNEP/SBCI (2013) State of Play of Sustainable Building in France 2012. Available online at: http://www.planbatimentdurable.fr/sortie-officielle-du-rapport-state-a762.html

[5] According to Work Ministry, the construction sector was involved in 43% of the frauds for moonlighting in 2012.

# 3. Research approach

## 3.1. Characteristics of the research object

The research objet of this thesis is sustainable real estate. Sustainable real estate, as part of the built environment, is a broad field, which involves several disciplines: engineering, architecture and design, economics, law, finance, management, sociology of organisations, human physiology, etc. (Chynoweth, 2009). To account for the complexity of this multifaceted research object, the thesis attempts to follow Edgar Morin's advice to tackle complexity in a non-simplistic way by aiming for transdisciplinary knowledge (Morin, 2005). This thesis thus examines different perspectives, and relies on various academic fields to understand how sustainable real estate is perceived by the stakeholders and gain insight on the meaning they give to its value. I aim to explore different levels of interactions, considering separately mechanisms at building level and at organisational level.

The rise of sustainability-related concerns in real estate is an ongoing trend. Sustainability regulations and certification schemes are swiftly changing, as well as perceptions and practices of the market players. Over the three years of the thesis, I observed clear changes in the documentations (CSR reports in particular) and in the interviews with market players. To account for these evolutions, I attempted to adopt dynamic approaches whenever possible, by examining longitudinal data and observation, and investigating change processes.

## 3.2. Research context

This thesis was undertaken as part of a CIFRE[6] agreement between the research laboratory and Novethic, a French research centre on responsible investment.

As part of my position in Novethic, I investigated French listed companies (construction companies, developers and real estate companies), asset managers of unlisted funds and institutional investors. This position was very helpful to gain access to market players and confront statements with more detailed information on actual practices. It was essential to identify issues that were further investigated for the thesis. In addition, I participated, first as project member then as mere observer, to the elaboration of an energy efficiency strategy for the real estate portfolio inside Caisse des Dépôts, a French public institutional investor. This experience helped me further immerse in real estate investors' practices and better understand inner workings of investment decision-making process involving sustainability-related topics.

To access market data on effective transactions, I appealed to brokers. These market players keep tracks of rental and sale commercial transactions. The transaction data are confidential, and brokers consider them as strategic since they use them in their advisory, research and valuation activities. However, DTZ Research kindly accepted to give me access to their database for my research.

[6] Convention Industrielle de Formation par la Recherche en Entreprise.

In addition, I participated to an international research project financed by the Sustainable Building Alliance (SBA) untitled "*Sustainability thresholds generating value*". This project aimed to propose concrete recommendations to market players (certification bodies on the one hand, analysts and valuers on the other hand) on the integration of sustainability-related data into investment decision-making process. This experience truly highlighted the reflexivity of researcher's work, which may both observe practices and contribute to their transformations.

# 4. Dissertation structure

The dissertation consists of five chapters, written as separate individual articles. For clarity purposes, these articles are organised into three parts corresponding to three research angles on sustainable real estate.

The first part is composed of the first two chapters. It investigates the notion of value associated with sustainable real estate, and aims to questions the limit of the business case on sustainable real estate to promote sustainable practices.

- **Chapter 1** takes a theoretical stance to question the notion of value associated with sustainability-related features at a building level. Based on a review of literature and existing initiatives, four approaches are distinguished to value sustainability-related criteria in real estate. Each approach is discussed as regards the type of value considered, and its ability to move the sustainability agenda forward, using concepts drawn from environmental economics.

- **Chapter 2** examines the value of sustainable practices at an organisational level. It provides empirical insights on how real estate companies perceive the impact of sustainability-related features on their corporate value, and how their perceptions have shape their strategies and organisations as regards the integration of sustainability-related topics. Empirical investigation relies on a longitudinal examination of the CSR communications of the 20 largest French real estate companies from 2008 to 2013. Results are interpreted thanks to CSR literature and institutional theories.

The second part comprises the third and fourth chapters. It examines sustainability certification schemes, in particular the HQE certification which is the widest spread in France. This focus is motivated by the fact that certification schemes have been widely considered as a proxy for the sustainable performance of buildings.

- **Chapter 3** examines the diffusion of certification schemes in the large office spaces market. It investigates successively diffusion among developers and investors, and diffusion among occupiers. It relies respectively on statistical information on new developments, and on a transaction database involving office spaces over 5,000sqm in the Greater Paris Region between 2005 and 2013. Literature on the diffusion of innovations is used to explore timeline patterns.

- **Chapter 4** examines further the demand for sustainable office spaces using a survey among occupiers (companies). It questions the existence of a demand for sustainability-related features beyond the mere presence of a label. To do so, it examines how occupiers' perceptions of certifications impact their motivations to occupy certified premises, their move decision process, and ultimately their actual occupation of certified premises. A conceptual framework is elaborated using literature on eco-labels and brand equity. Mediation models are used to test this framework.

Last part consists in the fifth chapter. It aims to explore the impact of sustainability-related topics on the long term value of buildings.

- **Chapter 5** examines the impact of the rise of sustainability-related concerns on the financial value of the building stock. It suggests that sustainability-related concerns represent a factor of obsolescence for existing buildings, and examines how this risk is tackled by investors. It thus relies on an analysis of investors' practices as well as on a review of existing projects and tools aiming to identify and remediate to obsolescence risks associated with sustainability-related trends. An illustrative simplified model, inspired by forest economics, is presented to highlight some limits of the current practices.

**Table 1** synthesises the topics, aims and approaches adopted in each chapter.

| | **Chapter 1** | **Chapter 2** | **Chapter 3** | **Chapter 4** | **Chapter 5** |
|---|---|---|---|---|---|
| **Topic** | **Clarifying the concept of value** | **Sustainability and value creation strategies at corporate level** | **Diffusion of certification schemes** | **Perception of certification schemes by occupiers** | **Impact on the obsolescence of the building stock** |
| **Key question** | What does it mean to value sustainability in real estate? | How and to what extent do real estate companies encompass sustainability in their value creation strategies? | How have sustainability certifications spread in the market of large office premises? | Is there a demand for sustainability features beyond the brand value of certification schemes? | How can sustainability be better integrated into investment decisions for the building stock? |
| **Market players considered** | Investors and their various stakeholders | Real estate companies | Developers and occupiers | Occupiers | Investors and owners |
| **Data / Approach** | Review of existing initiatives and critical discussion | Examination of the CSR communication of the 20 largest French real estate companies from 2008 to 2013 | Examination of the transactions on office premises over 5,000 sq m between 2005 to 2013 in the Greater Paris Region | Survey among French real estate corporate real estate managers. Hypotheses testing using mediation models | Analysis of investors' practices and review of dedicated tools. Discussion using an illustrative theoretical model |
| **Theoretical background** | Environmental economics | • CSR literature<br>• Institutional theories<br>• Organisational change theories | • Diffusion of innovations<br>• Literature on eco labels | • Literature on eco labels<br>• Literature on brand equity | • Obsolescence in real estate<br>• Investment calculations<br>• Forest economics |

**Table 1: Overview of the research articles**

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# PART 1

# Notions of value associated with sustainable real estate

This part examines the concept of value associated with sustainable real estate, and questions the extent to which the attempts to better appraise and showcase the benefits of sustainable real estate can help move forward the sustainability agenda.

**Chapter 1** discusses what valuing sustainability could mean and encompass at building level. As evidence on the impact of sustainability-related features on market prices piles up, professional bodies emphasise the need to better integrate sustainability-related criteria into valuation and investment decision process. This chapter thus confronts the four main existing approaches to value sustainable real estate to theoretical results from environmental economics. It argues that the existing attempts to integrate sustainability-related features into investment decision rely on different concepts of value. In particular, it distinguishes between market valuation and benefits assessments for the various stakeholders. Last, it proposes a theoretical outline to bridge the gap between the different approaches and suggest recommendations for investors willing to engage in responsible property investment.

**Chapter 2** analyses how the discussion on the financial benefits of sustainable real estate shapes the strategies and management practices of the real estate sector. Corporate Social Responsibility (CSR) literature is used to build a theoretical framework to examine the CSR communication of the 20 largest French real estate companies between 2008 and 2013. Results are interpreted thanks to institutional theories and organisational change literature. The chapter suggests that the emergence of a common belief in “green value” has contributed to legitimate sustainable real estate, but has not always resulted in a deeper shift in practices. If the leading real estate companies have developed value creation strategies based on sustainable real estate, most of them remain primarily driven by regulation and mimetic behaviours. Along these lines, the rise of sustainable real estate is primarily explained by isomorphic process in a context of more stringent regulation, professionalization and uncertainties on the market shifts, with “green value” being more a collective mantra rather than a true key driver.

# CHAPTER 1: Valuing sustainability for real estate investment

## 1. Introduction

Numerous reports document the environmental and social impacts of the real estate sector. Those impacts occur all along buildings life cycle from their construction to their demolition. Overall, the sector accounts for approximately a third of the global final energy consumption, more than a third global resource consumption (including 12% of fresh water use) and 40% of the solid waste production.[7] Social impacts include considerations on health and comfort for the building occupants, labour conditions (such as occupational accidents, moonlighting, etc.), and socio-economic impacts on the neighbourhoods and urban developments.

The social and environmental impacts of real estate ultimately depend on investors, who make the investment decisions. However, other agents are affected by these decisions. Tenants pay the energy and water bills, and their employees may suffer from eventual poor indoor conditions. Local authorities need to manage waste generated by the construction activities and the building occupation, and may face urban planning issue resulting from an inadequate integration into the neighbourhood. Citizens at large are impacted by the global warming resulting from the greenhouse gas emissions of buildings**. Figure 2** illustrates different impacts for the different stakeholders at different stage of the building life cycle.

| | Construction | In Use | Refurbishment | Demolition/ recycling |
|---|---|---|---|---|
| **Construction** | • Working condition<br>• Occupational accidents<br>• Exposure to pollutants<br>• Moonlighting | | • Working condition<br>• Occupational accidents and health<br>• Exposure to pollutants<br>• Moonlighting | • Working condition<br>• Occupational accidents and health<br>• Exposure to pollutants<br>• Moonlighting |
| **Occupants** | | • Indoor air quality<br>• Comfort (thermal, visual, acoustic)<br>• Image and reputation gains<br>• Expense savings from reduced energy consumption<br>• Expense savings from reduced water consumption<br>• Expense savings from reduced waste production | | |
| **Maintenance contractors** | | • Working condition<br>• Moonlighting<br>• Exposure to pollutants | | |
| **Neighborhood** | • Nuisance from the working site<br>• Exposure to pollutants | • Comfort (thermal, visual, acoustic)<br>• Increased attractivity | • Nuisance from the working site<br>• Exposure to pollutants | • Nuisance from the working site<br>• Exposure to pollutants |
| **Local authorities** | • Waste collection and treatment costs<br>• Water collection and treatment costs<br>• Energy generation and distribution costs | • Waste collection and treatment costs<br>• Water collection and treatment costs<br>• Energy generation and distribution costs<br>• Economic spinoffs | • Waste collection and treatment costs<br>• Water collection and treatment costs<br>• Energy generation and distribution costs | • Waste collection and treatment costs<br>• Water collection and treatment costs<br>• Energy generation and distribution costs |
| **Citizens** | • Impact on climate change<br>• Impact on resources depletion<br>• Impact on air, soil, water pollution<br>• Impact on biodiversity<br>• Impact on ozone depletion | • Impact on climate change<br>• Impact on resources depletion<br>• Impact on air, soil, water pollution<br>• Impact on biodiversity<br>• Impact on ozone depletion | • Impact on climate change<br>• Impact on resources depletion<br>• Impact on air, soil, water pollution<br>• Impact on biodiversity<br>• Impact on ozone depletion | • Impact on climate change<br>• Impact on resources depletion<br>• Impact on air, soil, water pollution<br>• Impact on biodiversity<br>• Impact on ozone depletion |

**Figure 2: Illustration of the multiple social and environmental impacts of buildings**

[7] UNEP (2011) *Towards a Green Economy*. Building Chapter, pp.320-363.

Investing in sustainability-related features mitigate these negative impacts, and may result in positive benefits for both investors and their stakeholders. In other words, sustainability–related features have both a private value (financial value for investors) and a social value (costs and benefits for the other stakeholders). When investing for sustainability-related features, investors thus "*generate private and public goods as a joint product*" (Kotchen, 2003, p.816). However, traditional decision-making process entails that investors only account for their private value when investing. This narrow focus typically results in sustainability-related upgrades less ambitious than what would have been selected if social value had also been considered.

As public institutions attempt to mobilise private market players on sustainability-related topics, improving investment process to better account for both private and social costs and benefits appears paramount. In particular, raising awareness on the value of sustainability-related features has been put forward as a solution to pave the way for a more sustainable real estate (Lorenz and Lützkendorf, 2011). Sectorial organisations such as World GBC, RICS, WBCSD or IIGCC[8] have thus aimed to drive investors to voluntarily integrate sustainability-related features into their decision process. Along these lines, academics and professionals have investigated the value associated with sustainable real estate, and discussed methodologies to better account for this value in valuations and investment decision process.

This paper reviews and examines these projects, and questions their ability to help move the sustainability agenda forward. It draws on environmental economics to examine the extent to which these initiatives help remove the barriers usually held accountable for the mismatch between private and social value.

The article is organised as follows. First, **section 2** presents a definition of sustainable real estate. This definition is used as a benchmark in the rest of the paper. **Section 3** reviews the key initiatives to value sustainability-related criteria within valuation and investment decision process. These initiatives are classified into four main categories according to the purpose and stance adopted. **Section 4** investigates the definitions of value underlying these existing approaches. In particular, I distinguish current attempts to integrate sustainability in market valuation, and the identification of value for the various stakeholders. **Section 5** discusses the effectiveness of each approach as regards the initial definition of sustainable real estate, using results from environmental economics. To bridge the remaining gap thus identified, **section 6** suggests practical recommendations for responsible investors willing to move a step further in their integration of sustainability criteria. Last section concludes.

[8] In 2005, the Royal Institution of Chartered Surveyors (RICS) has produced a report untitled "Green buildings, growing assets" highlighting the financial benefits of sustainable real estate. In its 2013 report untitled "The business case for Green Building", the World Green Building Council (World GBC) reviews benefits for investors, developers and occupiers. In its Energy Efficiency in Buildings project, the WBCSD promote energy efficiency programs for business companies. The investors group for climate change (IIGCC) published a report in 2013 untitled "Protecting the value of real estate" advocating the integration of sustainability in property risk analysis.

# 2. Definition of sustainable real estate

Sustainable development is usually used as a starting point to define sustainable buildings and more widely sustainability in a built environment context (see for example Lützkendorf and Lorenz (2005), Cole (2005b), Falkenbach *et al.* (2010), Berardi (2013)). Along these lines, sustainable buildings can be defined as "*buildings that contribute to sustainable development*" (Lützkendorf and Lorenz, 2005, p.214).

A frequently quoted definition of sustainable development stems from the Brundtland Commission stating: "*sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987, p.41). This definition entails that a sustainable activity must simultaneously meet two goals: filling functional requirements in serving human development and mitigating adverse impacts to ensure development conditions. In this regard, the sustainability agenda is not straightforward and evolves over time and space (Berardi, 2013). In practice, sustainable development principles have been described through three dimensions (environmental, social and economic) interrelated and overlapping.

The application of this concept to the real estate and construction sector is discussed in the ISO 1539:2008 standard.[9] This international standard proposes general principles to assess sustainability in the building and construction sector, according to a life cycle approach. The standard emphasises a holistic approach based on both functionality and sustainability assessments. It discusses what the environmental, social and economic dimensions mean for the built environment, including: health, cultural heritage, social equity, life quality and community. However, it does not provide indicators or benchmarks to be used in practice, stating that measurements of sustainability-related performance vary according to local conditions and evolve over time.

In practice, the terms "sustainable real estate" and "green buildings" are often used interchangeably. Certification schemes and labels such as the HQE in France, BREEAM in the UK, LEED in the US, DGNB in Germany, etc. are usually used as proxy to refer to sustainable buildings (Cole, 2005a; Cole, 2005b; Conte and Monno, 2012; Berardi, 2013; etc.). These assessment systems are based on lists of topics that can be clearly identified and monitored using sets of indicators (e.g. energy consumption per meter square) and required design features (e.g. presence of bicycle racks).

Although these tools indubitably contribute to promote sustainability, the operational definitions they rest on may become an end in itself, and may overshadow the initial sustainability objective (Cole, 2005a). These schemes may thus not be adapted to fully assess the contribution of sustainable buildings to sustainable development. Indeed, assessment schemes focus on environmental aspects within the physical boundaries of buildings (Cole, 2005b; Berardi, 2013). Consequently, they fail to account for the holistic nature of sustainability (Du Plessis and Cole, 2011), and neglect the interactions between buildings and the social and ecological systems (Conte and Monno, 2012), as well as the impacts of the whole supply chain (Berardi, 2013).

In this chapter, since the aim is to assess contributions to sustainable development, special attention is paid to the type of definition adopted by the projects reviewed. The expression "sustainable real

[9] ISO 15392:2008. Sustainability in building construction -- General principles.

estate" is used to refer to the integration of sustainable development concepts, as proposed by the ISO 1539:2008 standard.

# 3. Existing approaches to value sustainable real estate

Various professional bodies and academics have explored the value of sustainable real estate. Building on Lorenz and Lützkendorf (2011)'s classification of literature, I distinguish three strands of literature: publications on the costs and benefits associated with sustainable real estate, publications on its market added value, and initiatives for the integration into property (financial) valuation. In addition, I also consider publications investigating the non-financial value of sustainable real estate. This section presents the general approach of each of these four strands, and discusses implications as regards their applicability to decision-making process.

## 3.1. Analysing the costs and benefits of sustainable buildings

Several academics and professional bodies investigate the various monetary benefits of sustainable buildings, either through case studies or through statistical data. The benefits of sustainable office buildings entail operational savings (Hydes and Creech, 2000; Kats *et al.,* 2003; Roper and Beard, 2006), increased productivity resulting from improved indoor comfort conditions (Fisk, 2000; Heerwagen, 2000; Miller *et al.,* 2009), increased productivity resulting from efficient indoor layout (Haynes, 2008), corporate reputation and staff retention (Heerwagen, 2000; Kato *et al.,* 2009; etc.), mitigation of risks associated with future energy prices, etc. A numerous number of studies also exist on individual sustainable design elements such as green roofs (e.g. Carter and Keeler, 2008).

**Table 2** provides a list (non-exhaustive) of some key studies and the topics they tackle.

| **Article** | **Types of benefits** | **Type of study** |
|---|---|---|
| Hydes and Creech (2000) | Lower operating costs | case studies |
| Heerwagen (2000) | Improved productivity<br>Improved image and reputation<br>Organizational success<br>Lower operating costs | theoretical |
| Fisk (2000) | Reduction of respiratory illness<br>Improved productivity | case studies |
| Kats *et al.* (2003) | Lower operating costs<br>Improved health<br>Improved productivity | theoretical/<br>case studies |
| Matthiessen and Morris (2004) | Lower operating costs | empirical study |
| Roper and Beard (2006) | Lower operating costs<br>Organisational success | theoretical |
| Ries *et al.* (2006) | Improved productivity<br>Lower operating costs | survey |
| Haynes (2008) | Improved productivity<br>Organizational success | survey |

| | | |
|---|---|---|
| Miller *et al.* (2009) | Improved productivity | survey |
| Kato *et al. (*2009) | Increased employees' satisfaction<br>Improved productivity | survey |
| Singh *et al.* (2010) | Improved productivity | survey |
| Miller *et al.* (2010) | Higher operating costs | empirical study |
| Feige *et al.* (2013) | Improved productivity | empirical study |

**Table 2 : Examples of costs benefits studies on sustainable real estate**

The costs and benefits highlighted by these studies occur at different levels: at building level (e.g. operation expenses), at individual occupier level (e.g. comfort and productivity gains for individual employees), at the corporate level of the institutional occupier (e.g. corporate image, organisational success), at the corporate level of the building owner (e.g. owner's reputation) and at a more global level (e.g. mitigation costs of climate change).

For tenants, the total productivity gains resulting from improved comfort, higher satisfaction of employees, and more efficient organisation are described as more important than operating savings. Most studies mention productivity gains largely exceeding 1%[10] of total labour costs. This minimum figure represents more than 5% of rental levels, compared to less than 2% for utility expenses reduction for office buildings in the Greater Paris Region.

Results from these studies on costs and benefits have thus been used by professional bodies to build a business case to promote sustainable real estate among investors (World GBC, 2013). However, all the benefits identified do not directly affect building owners and investors. Some will benefit other market players (e.g. tenants or local authorities). These actors may choose to partially reflect their gains to the building owners through market mechanisms (lower vacancy, higher rents, lower taxes, lower interest rates, lower insurance premiums, etc.). To identify potential impacts on market value, several authors have thus focused on investigating transactions data.

## 3.2. Determining market added value for sustainable buildings

An expanding range of literature is dedicated to measuring the price premium granted to sustainable buildings compared to non-sustainable buildings. The various authors mostly use hedonic regressions on prices (either rental or sale prices) to appraise the implicit value of individual building characteristics (location, size, condition of the property, overall quality, presence of a certification, etc.). The resulting value obtained for sustainability-related features is interpreted as the market added value associated with sustainability. In most studies, certification schemes or energy labels are used as a proxy to examine sustainability performance. Some authors similarly investigate differences in occupancy rate between certified and non-certified office buildings.

Despite discrepancies between the studies, the existence of a market premium for the presence of a certification (all other things being equal) is now well supported by historical transactions data. Key results for office buildings are synthesised in **Table 3**.

[10] In its synthesis of publications on productivity gains associated with sustainable buildings, World GBC (2014) concludes that "*productivity gains of 8-11% are not uncommon as a result of better air quality*" (World GBC, 2014, p.8).

| Study references | Certification (country) | Market Value | Rental value | Occupancy Rate |
|---|---|---|---|---|
| **Wiley *et al.* (2008)** | LEED (US) | 130$/square foot | 15-17% | 16-18% |
| | Energy Star (US) | 30$/square foot | 7%-9% | 10%-11% |
| **Miller *et al.* (2008)** | LEED (US) | 10% | | |
| | Energy Star (US) | 6% | | |
| **Kok (2008)** | LEED, Energy Star (US) | 16% | 6% | |
| **Pivo and Fisher (2009)** | Energy Star (US) regeneration zones | 6.7%-10.6% | 4.8%-5.2% | 0.2-1.3% |
| **Eichholtz *et al.* (2009)** | LEED (US) | NS | | |
| **Fuerst and McAllister (2010)** | LEED, Energy Star (US) | 31-35% | 6% | |
| **Eichholtz *et al.* (2010)** | LEED (US) | 11% | 6% | |
| | Energy Star (US) | 13% | 7% | |
| **Kok *et al. (*2011)** | NABERS 5 stars (Australia) | 9% | 3% | |
| | Green Star (Australia) | 12% | 5% | |
| **Fuerst and McAllister (2011)** | LEED (US) | 26% | 5% | |
| | Energy Star (US) | 25% | 4% | |
| **Das *et al.* (2011)** | LEED(US) | | 0.1%-2.4% | |
| **Kok and Jennen (2012)** | EPCs (The Netherlands) | | 6.5% | |
| **Fuerst *et al.* (2012)** | LEED (2007 to 2012) (US) | NS | | |
| | Energy Star (2007 to 2012) (US) | 4.5% | | |
| **Kok *et al.* (2012)** | LEED EBOM (2005 to 2010) (US) | | 7-9% | |
| **Reichardt *et al*. (2012)** | LEEED (2000-2010) (US) | | 2.9% | NS |
| | Energy Star (2000-2010) (US) | | 2.5% | positive |
| **Fuerst *et al.* (2013)** | EPCs (UK) | | 11% | |
| **Nappi-Choulet and Decamps (2013)** | French EPCs (France) | NS | positive | |
| **Bonde and Song (2013)** | EPCs (Sweden) | NS | | |
| **Chegut *et al.* (2014)** | BREEAM (London, UK) | 26% | 21% | |
| **Gabe and Rehm(2014)** | NABERs (Australia) | | NS | |
| **Das and Wiley (2014)** | Energy Star (US) | 16.4% | | |
| | LEED (US) | 10.6% | | |
| **Newell *et al.* (2014)** | NABERs (Australia) | positive | positive | |

**Table 3 : Results of the hedonic studies on the financial performance of sustainable office spaces**

These studies help gain statistical evidence on the additional market value resulting from sustainability in real estate. Yet, these results vary according to time and location (Fuerst *et al*., 2012; Reichardt *et al.*, 2012) and are particularly sensitive to the model specifications. Chegut *et al.* (2014) particularly highlight the difficulty to control sustainability-related features from overall building quality.

Apart from informational purpose, the applicability of these results to integrate sustainability-related criteria into decision-making process is doubtful. Many authors (including Muldavin (2008), Runde and Thoyre (2010), Lützkendorf and Lorenz (2011) and Warren-Myers (2012)) criticise the use of these hedonic studies for property valuation. First, they remark that further details would be required. The statistical findings correspond to statistical results for a "reference building", which do not account for variations according to the property characteristics and market segments. Second, they caution against time lag issues, since hedonic results are based on past transaction data. Last, they point out that the value assessed through hedonic studies is not clearly defined. It may correspond to a brand value resulting from the presence of a label rather than the benefits resulting from the sustainability-related features themselves.

## 3.3. Improving property valuation process

Valuers have been blamed for not properly reflecting the impact of sustainability-related features in their valuation exercises (Warren-Myers, 2012). Several research projects and professional initiatives have been specifically dedicated to improve the integration of sustainability-related criteria into valuation or investment calculations. A list of these projects is presented in **Table 4**.

| Project name/ article reference | Period | Country | Type of value | Key content |
|---|---|---|---|---|
| **The Sustainable Property Appraisal project Ellison, L. and Sayce, S.** | 2004 - 2007 | UK | Worth (investor) | Appraisal system for investors. It consists in three separate tools:<br>1.a future proofing property questionnaire which sets a framework for investors to assess the risks associated with poor sustainability performance<br>2. the sustainability Appraisal Tool using the questionnaire results as inputs in a DCF<br>3. a pilot Sustainable Property Investment Index. |
| **Environmental value added Masato Ito Sumito Motrust** | 2005-present | Japan | Worth (investor)/ Market Value | Analysis of the added value from sustainability which is defined as the net income increase and the cost reduction between sustainable and non-sustainable properties. The use of environmental ratings is advocated as a support for the calculation of the added value. In particular, the project discusses possibility to connect real estate value appraisals to CASBEE rating system. |
| **Value Beyond Cost saving Green Building Finance Consortium Muldavin, S. (lead author)** | 2006-present | US | Worth (investor) | Suggestions on how to adapt existing appraisal methodologies such as the discounted cash flows to integrate sustainability issues transparently in the model inputs. It reaches beyond costs considerations (energy savings) to integrate broader impacts on value. On the whole, it reckons that no new methodologies are required but advocates a deeper understanding on how sustainability performances can affect tenants and how investors perceive the value of these features according to the market context. |
| **ESI-Property valuation Meins, E., Wallbaum, H., Hardziewski, R., Feige, A** | 2007-present | Switzerland | Worth (investor)/ Market Value | Proposition of methodology to integrate risks linked to poor sustainability performance due to future market shifts and regulation developments using a global adjustment factor called ESI. The ESI (Economic Sustainability Indicator) is constructed as follows. Property is rated against five key sustainability criteria. Experts' diagnosis on the potential impacts on value for different probabilised scenarios is used to weight each criterion. The resulting ESI Indicator is thus integrated in the DCF method in the discount rate as an addition to the property risk. |
| **RICS Valuation Information Paper N°13.** | 2009 | Europe | Market value | Guidance note for valuers. It recommends valuers to integrate sustainability issues in their value calculations only if there is evidence reflected in the market. |

| | | | | |
|---|---|---|---|---|
| **Immovalue project** | 2008 - 2010 | Europe | Market value | The project inventories approaches and methodologies on how new developments such as EPC/EPBD as well as life-cycle costing (LCC) and analysis (LCA) could be integrated in property valuation. |
| **Integrating Sustainability and Green Building into the Appraisal Process Runde, T. Thoyre, S.** | 2010 | US | Market value | Proposition of a three-step valuation model for real estate valuers. First step consists in assessing the market uptake of sustainability (importance of sustainability topics for the different stakeholders in the market). Second step consists in analysing the subject property using a sustainability risk matrix provided in the article. The subject property is thus positioned according to its sustainability performance in relation to the market standard and uptake. Last step consists in monitoring the evolution of demand and supply of sustainable properties (resulting in sustainable property liquidity) over time. |
| **Sustainability and Income-Producing Property Valuation Austin, G.W.** | 2012 | North America | Market value | This paper provides a systematic practical procedure for evaluating sustainable property. The underlying principle is that appraisers should systematically collect information on sustainability-related features as well as market context so as to adjust traditional input parameters. The uncertainty associated with the procedure is then assessed through a sensitivity analysis using Monte-Carlo simulations. |
| **RICS Sustainability and commercial property valuation. 2nde edition. Sayce, S., Quinn, F.** | 2013 | Europe | Market value | Guidance note for valuers, updating the note n°13 published in 2009. The guidance note encourages valuers to gather information on a sustainability checklist, assess their impact on value and integrate them in value calculation if reflected by the market and provide advices to their clients on sustainability issues beyond current market integration. |
| **How to calculate and present deep retrofit value Rocky Mountain Institute. Bendewald, M., Hutchinson, H., Muldavin, S. Torbert, R** | 2014 | US | Worth (Owner - occupier) | Guide providing practical guidance for owner occupiers as to how value deep retrofits beyond the mere costs savings. They define "Deep retrofit value is the net present value of all of the benefits of a deep energy or sustainability investment." Methodologies incorporate risks analysis and considerations to properly avoid double counting. Nine discrete value elements are considered:<br>1. Retrofit Development Costs<br>2. Non-Energy Property Operating Costs<br>3. Retrofit Risk Mitigation<br>4. Health Costs<br>5. Employee Costs<br>6. Promotions and Marketing Costs<br>7. Customer Access and Sales<br>8. Property-Derived Revenues<br>9. Enterprise Risk Management/Mitigation |
| **Monte Carlo Cash Flows and Sustainability: Stein, M., Braun, W., Villa, M. S.,** | 2014 | US | Worth (investors) | Cash flow model using Monte Carlo simulations to account for the decision-making process in front of different future scenarios. Various assumptions are tested for both costs and benefits of sustainability-related features through an integration into the different value input |

| | | | | |
|---|---|---|---|---|
| **Binding, V.** | | | | parameters. |
| **Renovalue Renovalue consortium** | 2014-present | Europe | Worth (Owner - occupier) | Training material for valuation professionals on sustainability features and their impacts on value drivers (rent, discount rate, capital expenditures, maintenance costs, etc.). The project stems in the belief that there is no automated formula to integrate sustainability into valuation process. Training valuers to account for sustainability as part of their daily assessment of buildings feature thus appears paramount. |
| **Valuing green building certificates as real options. Vimpari, J. and Junnila, S.** | 2014 | Finland | Worth (Owner - occupier) | Proposition of a methodology to assess green building certificates using real option and discounted cash flow (DCF) methodology. The added value of sustainability is evaluated using fuzzy analysis through experts' assessment of best guess, best case and worst case scenarios. |
| **Sustainability issues in the valuation process of project developments. Fröch, G.** | 2015 | Europe | Market value | System to incorporate the economic benefits of sustainability into the valuation of real estate project developments. Using a catalogue of parameters, key parameters for the specific project development to be valued are identified. These parameters are then quantified by means of distribution functions and checked for interdependencies. This analysis is incorporated into the calculation of the market value and the internal rate of return. Results are communicated through distribution functions. |

**Table 4 : Sample of projects on the integration of sustainability into financial valuation** (completed from a list published by Lorenz and Lützkendorf (2011) for the SBA project)

All the listed approaches aim to increase transparency in the integration of sustainability-related information into financial valuation and investment decision-making process. Differences exist in the manner this integration is conducted (Lorenz and Lützkendorf, 2011). Approaches may rely on a single global adjustment factor (e.g. Meins *et al.*, 2010), on adjustments for each input parameter (e.g. Muldavin, 2009), or a direct incorporation sustainability-related issues (e.g. Runde and Thoyre, 2010). Data sources used to value sustainability-related features also differ. They may be based on investors' own assessments (e.g. Ellison *et al.,* 2007), on statistical data, or on the identification of similar buildings (called "comparables") where transaction details are available.

More precisely, some authors focus on modifying existing standard methodologies to integrate sustainability-related features through external weights. For example, Meins *et al.* (2010) create an Economic Sustainability Indicator (ESI) which is integrated into the discount rate of a standard value calculation. The ESI is calculated thanks to a weighted average rating on five key sustainability-related criteria. The weightings are based on experts' appraisal of the importance of each criterion as regards potential future impacts on value. Ellison *et al.* (2007) also focus on building "future-proofness" as regards sustainability-related context trends. As opposed to the ESI, the investors themselves are required to rate the resiliency of the buildings being valued.

Other authors aim to improve existing valuation methodologies. Overall, they reckon existing methods are sufficient to integrate sustainability-related issues. They discuss how current valuation input parameters (rent, discount rate, capital expenses, operating expenses, etc.) could be better adjusted to account more precisely and more transparently for the impacts of sustainability-related

features. Lorenz and Lützkendorf (2011) and Muldavin (2009) have in particular advocated the use of discounted cash flows methodologies as it also enables valuers to be more transparent about how they take into consideration building quality in general. Other authors emphasise the respect of pre-established steps in the collection of data (both as regards building sustainability features and the market perceptions of sustainability) and the assessment. For example, Austin (2012) suggests a practical procedure for the systematic collection of sustainability-related information and assessment of their impacts on value. Runde and Thoyre (2010) propose a sustainability risk matrix to analyse the market context (regulation framework, supply of certification schemes, demand for sustainable features), and categorise the sustainability performance of the subject property according to the uptake of its sub-market. In addition, most authors caution against the uncertainty associated with the assessment exercise. Among others, Austin (2012) and Stein *et al.* (2014) recommend the use of Monte-Carlo simulations to account for uncertainty. Vimpari and Junnila (2014) use real options analysis calculated using a fuzzy-pay off method.

Ultimately, all these authors agree that no pre-established figure can be used. The integration of sustainability-related criteria will differ according to the characteristics of the property and the type of sub-market. The key challenge is thus to understand how sustainability-related features benefit the owner and users, and how these benefits will be apprehended through market mechanisms. Along these lines, Warren Myers (2012) concludes that valuers will be able to form their own assessment once they are educated on sustainable real estate and its impacts on market transactions.

## 3.4. Assessing non-financial value of sustainable real estate

Previous approaches focus on the financial valuation of sustainability. However, the benefits of sustainable buildings are not limited to financial gains for investors. As discussed previously, other stakeholders also benefit from sustainability-related features. In addition, all benefits may not correspond to monetary gains (Morrissey *et al.,* 2014). Along these lines, Lorenz and Lützkendorf (2011) advocate *"a widened understanding of the concept of property value*", which would encompass environmental, social and cultural value (Lorenz and Lützkendorf, 2011, p.611).

Few academic attempts to quantify non-financial value associated with sustainable real estate were found in the literature, although numerous articles mention its existence. Most initiatives come from professional projects for the development of operational tools to assess chains of value creation. Examples of projects are listed in **Table 5**.[11]

| **Name of the project/ reference** | **Type of value** | **Key content** |
|---|---|---|
| Birkenfield *et al.* (2011) (and following VBECs project from the Rocky Mountain Institute) | Intangible value | Project aiming to assess the intangible benefits of "high performance buildings". The quantitative tool developed focuses in particular on valuing productivity gains using results from cost benefits studies. The tool was developed further in the VBECS (Value Beyond |

[11] In addition to these projects linked to real estate, there is also a wider range of publications on residential buildings, and on the economic assessment of sustainable urban design (usually targeted at public decision-maker) which is out of the scope of this chapter and was thus not listed here.

| | | |
|---|---|---|
| | | Energy Cost Savings) project from the Rocky Mountain Institute, to appraise retrofit value for occupiers and owners. |
| Vernières *et al.* (2012) | Cultural value, Total economic value | Systematic approach for evaluating the economic impact of urban heritage. A multi-criteria analysis is proposed to identify the various benefits. However, the project stresses that the economic assessment itself will vary according to the project considered. It thus proposes a toolbox rather than a single economic assessment methodology. |
| Berardi, C., Eymeri, J. (2013) | Value in use, Value added | Framework to assess office buildings' contribution to corporate performance. Workspaces are assessed according to five dimensions: maximization of productive working time, effectiveness of the client relationship, well-being, organizational efficiency, and brand strategy. Performance is thus associated to a value added per employee, which closely depends on company types (size and sector). |
| Goodwill Management methodology (see Fustec *et al.* (2013) for a presentation) | Immaterial value | Methodology developed by the consultant firm Goodwill Management to assess and compare the immaterial value of buildings. The methodology rests on two steps: first, a rating of buildings on four dimensions identified as key for occupiers (technical design, functional quality, location and aesthetics); second, the economic assessment of the benefits for occupiers. This assessment is completed using both the ratings and economic estimations on productivity gains associated with sustainability-related features from academic publications. |
| Decadiese project (2011-2015) (see Nösperger *et al.,* 2015 for a project presentation) | Total economic value, Functional Performance | Decision support tool based on functional performance assessment and total economic cost benefits analysis. Seven functions are assessed: providing space, providing comfort, providing protection, providing suitable goods and tools for hosted activities, managing relationships with inside and outside people, minimising any negative impact, conveying a message and an image. Each function is rated using indicators. An economic assessment is thus completed using contingent valuation. |

**Table 5 : Examples of project assessing the non-financial value associated with sustainable real estate (commercial real estate only)**

These initiatives aim to propose an economic assessment of non-financial benefits. They refer to different concepts of non-financial value (e.g. intangible value for Birkenfield *et al.* (2011), immaterial value for Fustec *et al.* (2013), value in use for Berardi and Eymeri (2013). See **Section 3** for more details on these different concepts of value.

The scope of benefits examined may differ from one project to the next. For example, Berardi and Eymeri (2013) as well as Fustec *et al.* (2013) focus on the value for occupiers, whereas Nösperger *et al.* (2015) also encompass the minimisation of negative impacts for the local authorities. However, their underlying principles are quite similar. They all rest on findings from costs benefits studies. In addition, they reckon that the assessment exercise is necessarily context specific (type of project, type of tenants, location, site context, etc.).

These initiatives have several limits. First, the methodologies have difficulty accounting for synergistic effects (Birkenfield *et al.,* 2011). They rest on the aggregation of separate economic assessments of individual benefits, which raises the risk of double counting. Second, the economic assessments methods used (in particular contingent valuation) have been vividly debated (see among others Vatn and Bromley (1994) for a detailed discussion on this topic).

# 4. Clarifying the type of value underlying these approaches

Before investigating further the contribution of these four approaches to the sustainability agenda, this section examines more precisely their context and the concept of value they rely on. Indeed, understanding the valuation context is paramount to identify the boundaries and limits of the valuation exercise since it will determine "whose interests" are counted in the process and what limitations it entails (Vatn and Bromley, 1994).

## 4.1. Context and purpose of the four approaches

The first approach, assessing monetary costs and benefits, proposes economic assessments of the benefits resulting from sustainability-related features. The studies aim to build a theoretical business case for sustainable buildings, mainly focused on investors and tenants. Their results have been disseminated by professional bodies to promote sustainability topics among market players (see for example WGBC (2013)), and try to break "the circle of blame" identified by Cadman (2000) (see adaptation by the RICS, 2008).

The second approach, determining market added value, answers the question: how is sustainability currently being priced by the market? It consists mostly in hedonic studies on rental prices, sale prices and occupation rates, and aims to provide statistical evidence at a more global level through the analysis of market transactions. These studies have been used to inform valuers, analysts and investors on changing market uptakes (Warren-Mayers, 2012).They contribute to the business case of sustainable real estate for investors specifically.

The third approach, improving valuation process, aims to integrate more transparently sustainability-related features into financial valuation exercises. It focuses on market value appraisals, which correspond to practices framed by professional standards, and investment worth, where investors may have more leeway to reflect their own perceptions. This approach stems from two different rationale: the theoretical business case for sustainable buildings and the acknowledgment that valuers should better account for market evidence. This leads to apparently contradictory instructions: reflecting the market on the one hand, taking account of potential financial gains and risks which may not yet be reflected by the market on the other hand.

Last approach, assessing non-financial value of sustainable real estate, extends the valuation exercises to non-financial gains. Projects correspond to attempts at decision support tools, complementary to financial ratios. They consider benefits for the various stakeholders (and not just the building owners) to investigate broader concepts of value (intangible value, total economic value,

value in use, cultural value, etc.). However, most initiatives still aim to provide economic assessments of the benefits identified.

## 4.2. Financial valuation, price, market value and worth

Financial value reflects the anticipation of the future cash flows, i.e. monetary revenues which although uncertain can be quantified (Orlean, 2011, p.262). Whereas price is defined as an actual observable data in a transaction, market value and investment worth correspond to financial constructs used in particular for account books, reporting to financial players, and investment decisions.

In a real estate context, the RICS Valuation Standards defines market value as "*the estimated amount for which an asset or liability should exchange on the valuation date between a willing buyer and a willing seller in an arm's length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion*" (RICS, 2014, p.59). It must be distinguished from worth (also referred to as investment value) which corresponds to : "t*he value of an asset to the owner or a prospective owner for individual investment or operational objectives*" (RICS, 2014, p.61). Whereas market value refers to a hypothetical exchange, worth examines a specific investor's assessment of the monetary benefits associated to the ownership of the asset (French, 1997).

There has been a shift in the professional guidelines regarding the integration of sustainability in market valuation and investment worth appraisals. In its 2009 guidance note on sustainability, the RICS[12] insisted on the fact that the role of valuers was merely to reflect the market. It thus stated : "*If sustainability characteristics are recognised as having an impact, these are to be built into the calculation to the extent that an informed and well-advised purchaser would account for such matters*" (RICS, 2009, p.9). Along these lines, sustainability-related features could be accounted in valuation only to the extent that valuers could gather market evidence of their impacts on transactions. However, several experts have criticised this stance. Hill and Lorenz (2011) advocate the need for property valuers to not only reflect the market but to also inform on the social, economic and environmental context of buildings and their future impacts for building owners. In the second edition of its guidance note on sustainability, the RICS (2013) acknowledges the role of valuers to inform their clients beyond the mere integration of market evidence. In particular, "*valuers are advised to collect appropriate and sufficient sustainability data as and when it becomes available for future comparability even if it does not currently impact on value*" (RICS, 2013, p.10). For developed market where evidence is piling, it is no longer a question about if sustainability should be integrated but how to do it (UNEP FI, 2014). However, by definition, market value and worth can only account for features and qualities having a financial impact (at least expected).

## 4.3. Values and non-financial valuation

The concept of financial value does not reflect all the qualities associated with a good or service. Simply put, one may "value" something beyond the expectations of the financial gains it will offer. As

[12] The RICS (Royal Institution of Chartered Surveyors) is a international real estate professional association.

opposed to financial value, Anderson (1993) advocates a pluralist concept of value, accounting for ethical beliefs, ideals and emotions. Her approach is closer to the everyday experience of value: "*to value something is to have a complex of positive attitudes toward it, governed by distinct standards for perception, emotions, deliberation, desire, and conduc*t" (Anderson, 1993, p.3). Value is thus tightly linked with values, i.e. a reference system that frames perceptions and decisions. Along these lines, it is thus also possible to define a cultural, aesthetic or moral value (Klamer, 2003).

In this context, the value of sustainable real estate is associated with the perceptions of the multiple benefits of sustainable buildings. These benefits may correspond to pecuniary gains (e.g. energy savings) or intangible gains (e.g. sustainability brand conveyed by the possession or occupation of sustainable premises). They may result from tangible advantages or from the beliefs associated with sustainability-related features (e.g. the satisfaction resulting from contributing to sustainable development). Among others, Morrissey *et al.* (2014) suggests investigating the flows of the various types of value for stakeholders to inform retrofit decisions.

To help decision-making process, several projects attempt to propose an economic assessment of broadened concepts of value, with different meanings of value and valuation according to the disciplines (Farber *et al.*, 2002).

In consumer research, value in use refers to "*the extent to which an owner holds a possession to be dear, independent of exchange opportunities*" (Richins, 1994, p.505). It relates to the meaning a possession or utilisation of goods or services has for the consumer. This concept has been investigated using surveys to understand what consumers seek in an object (Richins, 1994). In real estate, the approach proposed by Berardi and Eymeri (2013) can be classified in this category. They focus on valuing the benefits occupiers can expect from the occupation of sustainable premises.

In business accounting, intellectual capital (referred to as immaterial value by Fustec *et al.*, 2013) denotes the intangible assets of a company and encompass the various capitals allowing a company to operate: internal structure of capital (e.g. brands, patents, expertise and process), human capital (e.g. employees' skills), and external structure of capital (e.g. networks of clients and contractors) (Hussi, 2004). Intellectual capital and intangible assets are used to expand the accounting concept of value and address interactions between the firm and the larger system it belongs to (Allee, 2000). This literature has inspired the approach commented by Fustec *et al.* (2013). In practice, it is quite similar to Berardi and Eymeri (2013) although the conceptual backgrounds differ.

In environmental economics, the concept of "total economic value" was coined to take into considerations the value of environmental systems and public goods (Bontems and Rotillon, 1998; Turner *et al.*, 2003). It is traditionally defined as the sum of use value and non-use value. Use value derives from the actual use of the good. It can be differentiated between commercial use value when a market exists, and in situ use value when the good is consumed directly without the presence of a market (no transaction involved). It is usually assessed through market prices (actual market or equivalent market if the good or service being valued is not traded). Non-use value takes into account the potential future use value ("option value"), the value arising for our will to bequeath it to future generation ("bequest value") and the value associated with the mere existence of the environmental system ("existence value"). The various types of value are usually assessed through costs benefits analyses, or contingent valuations. The total economic value represents the sum these different use and non-use values (Bontems and Rotillon, 1998). The Decadiese project rests on this literature.

## 4.4. Impact on the value for investors

All these approaches rest on an analysis of the benefits provided by sustainability-related features. However, they differ in the type of benefits examined (financial benefits, other economic benefits, intangible assets, cultural value, etc.) and the scope of the analysis (building owner only, building owner and occupiers, wider range of stakeholders, etc.).

Financial value only focuses on financial gains that will impact owner's cash flows. However, it is also impacted by the other types of value, as illustrated in **Figure 3**. Economic and immaterial value for occupiers may translate in higher rental prices and thus higher financial values for the owners. Environmental value may be translated into tax and norms that will translate in future negative cash flows for the investors, etc. Understanding the mechanisms of broader value creation is paramount to assess how sustainability could impact financial value.

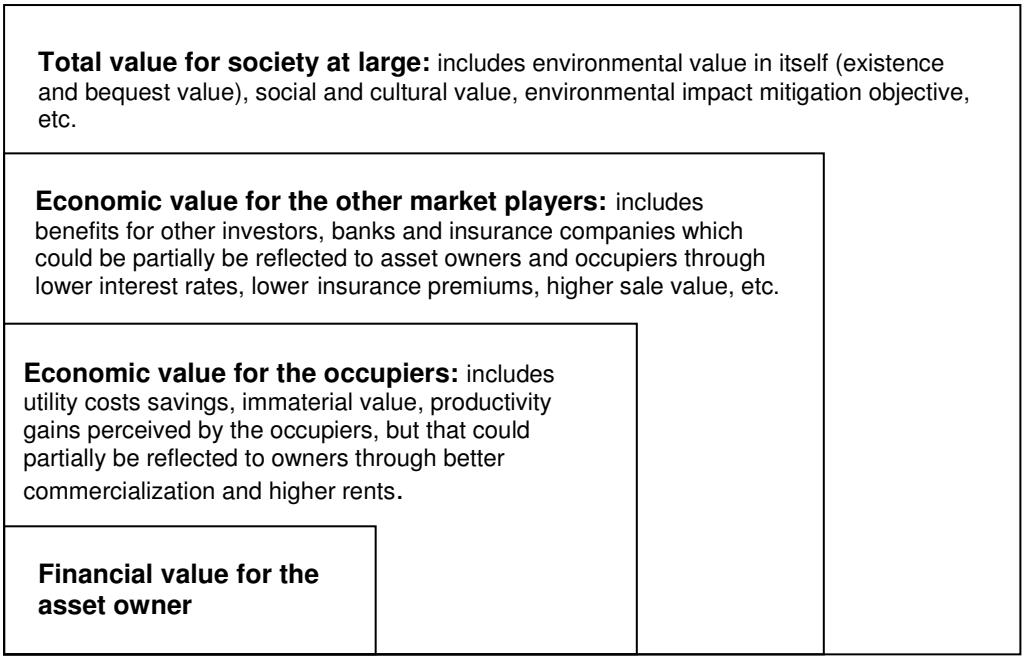


**Figure 3: Value creation chains associated with a widened understanding of the concept of value** (source: developed for the SBA project)

Sustainability–related benefits for other stakeholders may not necessarily translate into financial value for the investors themselves. However, examining this wide range of benefits may help identify potential future mechanisms through which sustainability-related features may impact future financial value. This broadened approach may thus help mainstream investor (who mainly consider their financial interests) to better identify sustainability risks and opportunities associated with sustainability.

# 5. Appraising contributions to the sustainability agenda

In the four approaches discussed, valuing sustainability-related features appears paramount to integrate them into investment decisions. It is however unclear to what extent these approaches will be sufficient to help move the sustainability agenda forward. This section thus investigates how these approaches help deal with the barriers traditionally held responsible for the poor integration of sustainability issues, using environmental economics. I focus on externalities, principal-agent issues, incomplete information and market dynamics.

## 5.1. Transposition in an externality framework

Externalities arise when the actions of an economic agent impact other agents beyond exchanges in a market. They correspond to a divergence between private and social costs resulting from a market failure (Dahlman, 1979). In neoclassical theories, the internalisation of externalities in the decision-making process of the different market agents is reckoned to be sufficient to ensure market efficiency.

Two strands of literature are opposing. According to Pigou and the authors that followed, externalities can be corrected thanks to regulatory constraints (Dahlman, 1979). Regulators will set standards, tax, subsidies or tradable permits to create a price for the social costs generated by the externalities. This constraint will ensure an alignment between social and private interests. As opposed to the Pigou tradition, Coase (1960) does not rely on an omniscient government to correct externalities (Demsetz, 1996), arguing that practical limitations of government intervention would reduce the benefits of regulation. In his theorem, Coase asserts that negotiations between the agent causing the externality and the affected agent may be used to internalise externalities if transaction costs are sufficiently low. However, in most cases, such bargaining would be too complex and expensive to implement. Regulators could thus intervene by helping the bargaining to take place.

Sustainability in real estate can easily be transposed as a problem of externalities. Through their real estate investment decisions, investors affect a wide range of other agents: the tenants, the final occupants, the neighborhood, the local authorities, etc. All these impacts are not necessarily accounted for in market transactions. Tenants may not be informed on the environmental quality and the associated benefits of the premises they wish to rent. In addition, investors are not in transaction with all the economic agents who benefit from their investment for sustainability performance. Local population and citizens do not have any market transaction with investors and there is no systematic market for characteristics such as greenhouse gas emissions, or the positive economic spinoffs in a neighbourhood. In consequence, if sustainability upgrades benefit a wide range of stakeholders, their investment costs are fully supported by investors only. Investors may thus not have sufficient incentive to invest in the level of sustainability that would be socially optimal.

Different barriers explain the existence of externalities in the real estate sector. In particular, evidence of market failures with respect to energy efficiency (see Howarth and Andersson, 1993; Jaffe and Stavins, 1994; etc.) indirectly applies. Next paragraphs analyse some of the traditional barriers put forward in this literature.

## 5.2. Principal-agent problems

Principal-agent situations arise when an agent perform a task for another agent, the principal, in a way that is contrary to the principal agent's best interest (Bontems and Rotillon, 1998). This issue occurs in numerous situations in the real estate sector. The most documented situation corresponds to owners investing to improve energy efficiency whereas the occupiers are the ones who mostly benefit from the improvements (Murtishaw and Sathay, 2006). Similar situations exist with the other stakeholders benefitting from sustainability upgrades. In addition, principal-agent situations also exist inside the organisations themselves. For example, within occupiers' organisation, the decision to move into a new location may be the responsibility of several departments. These departments may have different motivations when letting a new office space. Department sin charge of purchases and procurements will probably aim to reduce the total financial costs associated with the transfer (occupation costs), whereas human resources departments may be more receptive to the improved indoor quality of sustainable office spaces and their impacts on employees' productivity, etc.

**The previously discussed approaches to value sustainability in real estate were focused on financial benefits for owners on the one hand, and on economic benefits for other stakeholders on the other hand. They provided little insight on how investors could be rewarded for the theoretical benefits identified for stakeholders. Better understanding on mechanisms at stake would be required.**

## 5.3. Incomplete information

Even if other agents may be willing to reward the investor for sustainability benefits, thus bypassing principal-agent issues, information on sustainability performance and its benefits is often incomplete.

Sustainable performance is not a visible characteristic. Collecting data on the sustainability-related characteristics is costly. It requires for example undertaking of audits, gathering and processing of energy and water invoices, installation of meters, etc. This information is usually not known by prospective tenants wishing to let premises. However, according to Akerlof (1970), when prospective buyers are uncertain on the quality of their purchase, sellers may be tempted to market poor quality goods. Along these lines, this asymmetry of information may drive investors to underinvest in sustainability-related features. Currently, environmental certification schemes are the main tools used in the market to signal the quality of buildings as regards sustainability.

In addition, tenants as well as other stakeholders may not be aware of the benefits associated with sustainable real estate. Initiatives to disseminate information on these benefits to all stakeholders, and not merely to investors, would certainly be a first step to ensure a better integration of sustainability issues.

**The role of certification schemes to distinguish credibly between sustainable and non-sustainable buildings is paramount. Two situations may arise. If certification schemes are indeed perceived as a credible differentiating factor, their direct integration into valuation appraisal is legitimate.**

**Conversely, if stakeholders remain unsure of the performance of certified premises, valuation must necessarily account for actual sustainability characteristics and measurements. In both cases, the extent to which stakeholders are aware of sustainability performance and their benefits conditions the level of integration of sustainability-related criteria in the approaches based on market value and financial worth assessments. By contrast, it does not necessarily impact approaches based on a broadened understanding of value.**

## 5.4. Market dynamics

The context on sustainability topics is swiftly evolving in real estate. Regulations are gradually strengthened, and certification schemes spread rapidly. For example, the French new building code (RT 2012) requires developers to divide by three the energy consumption of all new buildings (either residential or commercial). In addition, whereas there was virtually no building with environmental credentials in 2005 in the French market, 5 years later, certification schemes have become a market standard for large office buildings (over 5,000 sqm). These swift changes result in uncertainties for investors, and may further hinder the integration of sustainability-related issues into investment decisions.

**Accounting for sustainable performance of buildings requires taking into account the market dynamics as regards sustainability. Market data, based on past transactions, may thus lead to a valuation lag if used in new value calculations. Even though they may account for the market players' anticipations on future market trends as suggested by French (1997), they are still lagging when the context evolves rapidly. Understanding the drivers of how sustainability is perceived thus represents the most effective solution.**

In addition, these swift changes in the context entails that stakeholders may not be set in their own appraisal of sustainability-related topics. In particular, Elster (1997) emphasises that preferences are not fixed, but shaped through decision-making process, negotiations, discussions, etc. Evolving contexts thus entails that preferences may evolve.

**Assessing the value sustainability-related features hold for the various stakeholders requires understanding how these preferences may be shaped according to context evolutions, and interactions between market players.**

## 5.5. Limitations to the contributions of value appraisals

If as suggested by Stavins and Jaffe (1994), it may be possible to eliminate market failures linked to incomplete information, methods such as market value and worth calculations would still not be able to result in a socially optimum level of investment in sustainability-related features, due to externality issues, and principal-agent situations. Overcoming this remaining gap would require a larger framework to account for the other types of value.

However, broadened economic valuation of sustainability-related features may not be up to the task either. Gustafsson (1999) argue that environmental issues are too complex and involve too many

parties to be fully apprehended by prices. Among others, Vatn and Bromley (1994) argue that externalities are "*basically novelties*" which are not always distinguishable until after they have been produced, and are thus very difficult to appraise. In addition, public preferences are seldom given but rather shaped through public discourse (Elster, 1997; Söderholm and Sundqvist, 2003). More than the economic assessment exercises themselves, these approaches may be interesting by the opportunities of discussion with the various stakeholders they offer.

# 6. Bridging the gap from financial rationale to values

The four approaches discussed in the previous sections are all limited in their contributions to the sustainability agenda. Valuing sustainability-related criteria is not an end in itself. It is only a tool, at the service of decision-making process, and the promotion of sustainability-related issues. If investors mainly want to assess how they can hope to benefit from a swift sale of their property, the financial approaches discussed seem adapted. If investors want to contribute to the sustainability agenda, deeper shifts are required. The economic assessment of a broadened range of benefits is a first step, but cannot replace investors' willingness to follow their own environmental and social values (here understood as beliefs). This section discusses potential avenues in this direction.

## 6.1. CSR as a means to correct externalities

Several academics advocate that Corporate Social Responsibility (CSR) could be a means to correct externalities.

McWilliams and Siegel (2011) define strategic CSR as responsible activities aiming at providing competitive advantage, and argue that companies engaging in strategic CSR participate to the private provision of public goods. This stance may be a little optimistic. The economic success of CSR strategies rests on stakeholders (i.e. tenants, local authorities and other financial market players for the real estate) rewarding investors for their endeavour. In this respect, Brammer *et al.* (2012) are pessimistic, and contend that : "*To the extent that CSR lacks institutional supports, stakeholders are unlikely to reward good behaviour or sanction bad behaviour"* (Brammer *et al.,* 2012, p.18).

Johnston (2012) thus defends a more restrictive vision, defining CSR as "*corporations voluntarily taking responsibility for, or internalising, the social costs, or externalities, or impacts their operations create*" (Johnston, 2012, p.6). He argues that CSR can correct externalities only if two conditions are met. First, company managers engaging in CSR must acknowledge the need to change their decision process to account for the social costs resulting from their activities. Second, regulation must steer company managers along this internalisation of social costs through a reflexive regulatory approach, in particular thanks to the instauration of a dialogue with stakeholders.

These two aspects have been partially discussed in the built environment context. In particular, Du Plessis and Cole (2011) suggest a change in paradigm to motivate the shift towards sustainability in the construction and real estate sector. In particular, they argue that sustainability-related features

should not be dissociated from other real estate characteristics, since they form a complex and evolutive system with interdependencies and multiple causalities. In this respect, Moffat and Kholer (2008) advocate apprehending the built environmental as a "*social-ecological system*". In addition, Du Plessis and Cole (2011) also recommend a shift in the relations with stakeholders. They advocate new mays of making decisions, to bypass apparent conflicts of interests, through cooperation. "*In this way, the mindset from which decisions are made by the various stakeholders is changed from one of prescriptive and fixed control mechanisms to a reflective process that is anticipatory, responsive and flexible*" (Du Plessis and Cole, 2011, p.442).

Such a reflexive approach involving the joint collaboration with other stakeholders could pave the way for a third method to correct externalities, as an alternative to regulation instruments and "Coasean Bargaining". CSR policies with the participation of stakeholders in the decision-making process could ensure that the various dimensions of value creation could be accounted for, with the joint creation of value, mutually beneficial to all.

## 6.2. Engaging with stakeholders

First step for investors attempting this endeavour would thus consist in identifying stakeholders. Traditionally, the key stakeholders considered are the developers who assist in the construction stage, the tenants who rent buildings during their exploitation stage and the authorities which provide the regulatory framework in which the market players operate. Initiatives for cooperation with these key stakeholders already exist. In particular, green leases correspond to appendices in lease contracts which require tenants and investors to exchange information on the environmental performance of the premises (energy and water consumption, waste management, state of equipment, etc.) and to elaborate common action plans to improve said performance

In a broader understanding, other type of stakeholders may also be introduced. Mitchell *et al.* (1997) distinguish direct stakeholders who affect directly the achievement of companies' objectives, and indirect stakeholders who have little power to do so. Developers, tenants and authorities would correspond to this first category. Nature and future generations would belong to the second category. If they are often perceived as "*silent stakeholders*" (Du Plessis and Cole, 2011), they do impact the project success though "feedback loops" between human activities and the functions and services supported by the environmental and social systems.

This stance entails significant changes in the decision-making process and opens new strategies of value creation. A few attempts to form broadened stakeholders' panel have emerged. For example, in its new framework, the Global Reporting Initiative[13] recommends companies to identify their material sustainability topics and elaborate their main sustainability targets. In order to do so, it suggests using of a consultation process with the firm's various stakeholders. For instance, French listed company Gecina has instituted a review of its CSR action plan by a stakeholders' panel group. A committee composed of 7 independent CSR experts regularly challenges the integration of

[13] The Global Reporting Initiative is an international non-profit organization, which promotes standards for environmental, social and governance information disclosure through reporting guidelines. In its new framework, GRI G4, the organisation advocated more strategic reporting through the identification and the focus on "material" topics.

sustainability in Gecina's activities. However, these attempts are still at an early stage. They are still mainly focused on tenants, although NGOs representation is rising. In addition, they still merely correspond to a consultation process rather than a true cooperation to identify joint value creation channels.

### 6.3. In practice, a translation exercise with different levels of engagement

At a practical level, the integration of sustainability-related characteristics into investment process could thus be described as a translation exercise with stakeholders involving three steps: first, assessing building performance; second, identifying the various benefits and value creation channels for stakeholders; third, appraising potential impacts on financial value for investors and building owners. The overall "translation" process is illustrated in **Figure 4**.

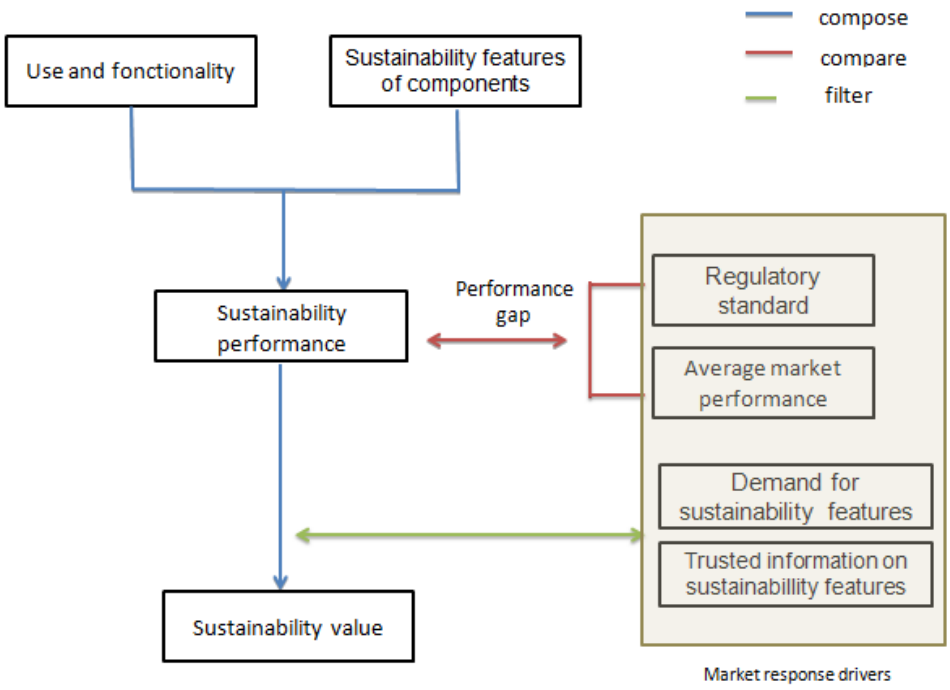


**Figure 4: From sustainability assessment to sustainability value**

As a first step, sustainability-related features in buildings can be described as part of the buildings characteristics (location, technical installations, integration in the local environment, services provided to the occupants, etc.). For further details, Lützkendorf and Lorenz (2011) investigate the long list of building characteristics necessary to appraise the sustainability performance of real estate assets. These characteristics can in turn be used to assess sustainability performance against a benchmark, accounting not only for building intrinsic characteristics but also for the quality of its operation and its conditions of use. Building overall performance (or quality) will thus vary according to specific building context, and evolve over time as the supply of sustainable buildings increases and the stakeholders' expectations get more stringent.

This performance assessment may thus be used to identify additional benefits for the various stakeholders. The underlying idea is to appraise more globally the different types of value that stakeholders associate with sustainability performance through a collaborative process. The purpose

of these discussions with stakeholder is three-folds: raising awareness on potential sustainability benefits, identifying sustainability features which have the most importance for stakeholders, and investigating mechanisms through which investors may be indirectly "rewarded" for investing for sustainability features. This "reward" is not necessarily pecuniary. It may merely correspond to a higher level of acceptation by local authorities, or increased attractiveness.[14] Ideally, this consultation should be fully integrated in the decision making process.

Last, this examination may be used to inform financial ratios. Most of the benefits identified will not translate into immediate market value and worth for investors. Mainly financial gains directly received by investors or indirect financial gains perceived indirectly by the investors as a reward in a bargaining with another stakeholder would be reflected in the market value. In this last step, understanding how sustainability-related topics are being integrated by market players is paramount to identify future trends and perform risks assessments. Key parameters as regards the market responses drivers are: the perception of sustainable buildings by market players, information on sustainability-related features and their benefits, and the current state between supply and demand for sustainability-related features in both the space and asset markets.

The financial appraisal is only the last step of a broader approach, which involves a longer constructive consultation with a wide range of stakeholders. The level of ambition of the consultation stage will depend on the level of commitment of investors as regards sustainability. Mainstream investors may only examine stakeholders. Responsible investors (i.e. investors aiming to have a social and environmental contribution beyond their financial short-term interests) should rely more heavily on the consultation stage, and involve stakeholders in their decision-making process to pave the way for joint value creation strategies.

# 7. Conclusion and perspectives

When investing in sustainability-related features, investors make decisions which impact a wide range of stakeholders over different time spans. If they support the full costs of the mitigation of negative impacts, they only reap a small portion of the total benefits generated by their actions. Consequently, according to environmental economics, investors do not have the sufficient incentive to invest in the level of sustainability that would be socially optimal.

In order to promote the integration of sustainability-related features in investment decisions, academics and professional bodies have put forward the value of sustainability-related features, and discussed methodologies to improve their integration in valuation exercises. Different interpretations of the notion of value have been use. When value is understood as market value and price, valuation can only reflect benefits from sustainability-related features which impact (or have an anticipated impact on) the financial cash flows. Due to market failures and the existence of externalities,

[14] "*As investors and occupants become more knowledgeable about and concerned with the environmental and social impacts of the built environment, buildings with better sustainability credentials enjoy increased marketability.*" (World GBC, 2013, p.10)

sustainability-related issues may not be fully integrated in the calculation. Integrating a wider range of sustainability issues thus requires accepting moving beyond the market box framework.

Two types of approach should be distinguished: mainstream investors merely aiming to manage financial risks associated with sustainability, and responsible investors aiming to contribute further to the sustainability agenda. In the first situation, financial ratios remain the key support to investment decision. A better understanding of the impact of sustainability-related features on value is only part of the financial valuation process. However, it is paramount to fully inform decisions on potential financials risks and opportunities. In the second situation, the appraisal of financial gains and risk associated with sustainability-related features is not sufficient to properly address the sustainability agenda. Responsible investors should develop thus their own approach to appraise both tangible and intangible benefits of sustainable real estate, in collaboration with a wide range of stakeholders. This consultation process enables responsible investors to engage with the various stakeholders, and thus to identify of potential for shared value creation on the long term.

Valuation methodologies should only be considered as tool in the integration of sustainability concerns. They should not be confused with the final objective: contributing to the sustainable development agenda. In particular, a strong emphasis on the financial business case of sustainability raises the risk that the sustainability agenda be always subordinated to financial prospects, with no realignment of priorities compatible with the sustainability agenda (Capron and Quairel-Lanoizelée, 2015). At the end of the day, it is the values and the belief on what is right for sustainable development that will motivate a deeper change.

"*The hypothetical valuation exercises may be its own regard for what it tells us about how individuals value non ordinary aspect of their lives. But the most fundamental environmental choices will continue to be made without prices – and without apologies*. "

(Vatn and Bromley, 1994, p.145)

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# CHAPTER 2: CSR policies and value creation strategies of real estate companies

## 1. Introduction

The financial business case for Corporate Social Responsibility (CSR) has fascinated both academics and practitioners. It represents a seductive solution to foster sustainability-related features while helping the business (Brammer *et al.,* 2012). Benefits from sustainable practices could provide incentives for companies to voluntarily account for sustainability issues, while legitimating this endeavour to their shareholders. However, literature dedicated to verifying the extent to which CSR business case provides sufficient incentive to adopt sustainability policies and change business models remains scarce.

The real estate sector is no exception to this fascination for the business case of sustainability-related features. The expression "green value" was coined to refer to the added value of sustainable buildings as opposed to non-sustainable buildings. Different approaches exist. At the building level, some authors examine the costs and benefits of sustainable buildings. They highlight operating costs savings (Kats *et al.*, 2003), reputation benefits, productivity gains for the employees occupying sustainable office spaces (Heerwagen, 2000), etc. Other authors specifically investigate the empirical links between sustainability credentials and market value using transaction data *(*Fuerst and McAllister, 2008; Fuerst and McAllister, 2011; Wiley *et al.,* 2010; Eichholtz *et al.,* 2010; etc.). Most authors find positive relations with sale prices, rentals prices and occupation rates. At a corporate level, there is evidence that sustainable buildings and CSR performance have a positive impact on the financial performance of real estate companies (Eichholtz *et al.,* 2012; Hin Ho *et al.,* 2013; Sah *et al.,* 2013; Cajias *et al.,* 2014).

Progressively, results from these academic studies have spread among professional publications (guidance from international valuation bodies, market insights, etc.) and media articles. Google counts provide an illustration[15] of the fast diffusion of the use of "green value" in association with sustainable real estate. Statistical findings are presented in **Figure 5.** (See **Appendix 1** for more details.)

These professional publications tend to present "green value" with a messianic connotation, suggesting that its emergence would represent a means to offset adverse economic conditions. This messianic overtone is particularly illustrated in the media articles with expressions such as "*The rise of the green value*"[16] , "*Green value matters more and more*"[17], "*Green value is here!*"[18], etc. Identifying green value thus appears as a quest for a Holy Grail which will both foster the

[15] As google counts are not accurate and may add up occurrences not directly linked to our context despite manual verification this exercise mainly corresponds to a rough appraisal.
[16] http://www.cler.org/L-emergence-de-la-valeur-verte
[17] http://www.actu-environnement.com/ae/news/immobilier-valeur-verte-compte-de-plus-en-plus-20144.php4
[18] http://www.planbatimentdurable.fr/immobilier-la-valeur-verte-est-la-a758.html

sustainability agenda and lay the foundations for value creation strategies in an unfavourable economic context.

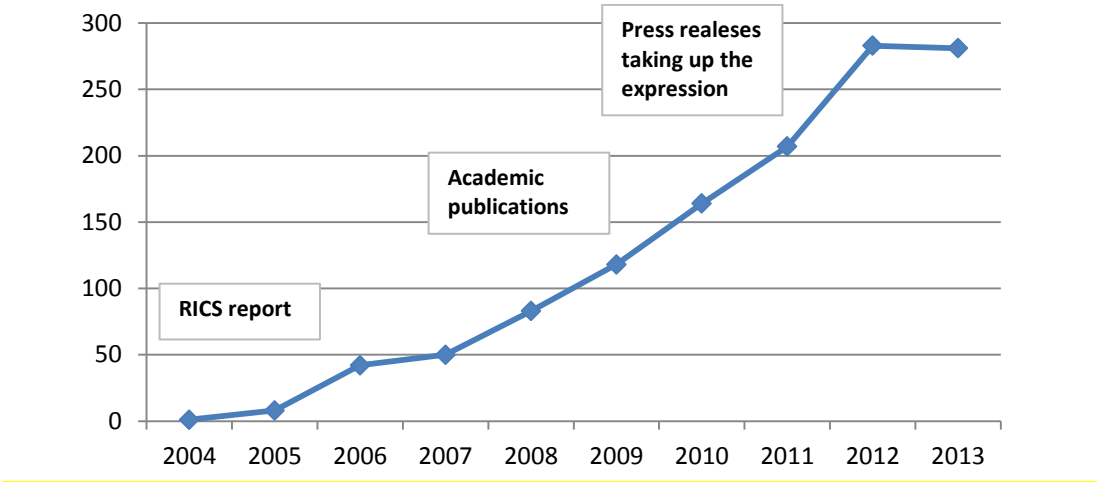


**Figure 5: Google counts of "green value" in a real estate context**

Is green value a key motive for companies to change their business model or is it merely "green invoking"? To what extent has the "green value" talk impacted the core practices of the real estate sector? This paper aims to examine how and to what extent the discussion on the financial benefits of sustainable real estate has shaped the CSR strategies and management practices of real estate companies. Understanding companies' motivations to implement sustainability practices is crucial since it will ultimately influence the level of integration into companies' core businesses and the impact regulation bodies can expect from voluntary initiatives. If CSR is primarily driven by the institutional context, regulation is paramount to trigger the shift of the sector. It will need to be sufficiently thorough so as to avoid the implementation of superficial behaviours which uphold the letter but not the spirit of the regulation. If CSR is primarily driven by the business case, regulation needs only develop a context conducive to the emergence of a competitive advantage for CSR behaviours.

There is an expanding body of literature and studies on sustainable real estate and its integration by companies. Using interviews and surveys, Pivo (2008), Jones *et al.* (2009) and Boisnier (2010) assert that sustainability concerns are becoming a key part of real estate management. In the 2013 GRESB report[19], all the 543 international real estate managers surveyed claimed to use sustainability risk assessments, and 70% of them had already implemented environmental management systems. This trend has not left smaller fund managers aside. According to Novethic' s studies[20], two thirds of the French fund managers surveyed analyse the energy performance of their new acquisitions, and the figure steadily increases over the years.

Yet, the main driver and the extent of this shift remain unclear. Attuyer *et al.* (2012) suggest that French professionals have started integrating sustainability-related features for fear a more stringent regulatory context could result in a "brown discount" for poorly performing assets. They highlight the

[19] http://gresb.com/

[20] http://www.novethic.fr Novethic surveys on real estate fund managers (2011, 2012, 2013). In 2013, the survey covered more than two thirds of the French third party asset managers with active registered OPCI or SCPI.

prevalence of legal and financial motives. The situation is similar at an international level. In Australia, Warren-Myers (2012) wonders whether sustainability is merely a new way to communicate on existing best management practices. She concludes that sustainability-related practices are focused on costs minimisation strategies with a repackaging of best management practices as "*sustainability initiatives*". These publications tend to suggest that the integration of sustainability-related features has not resulted in a transformation of companies' business model. However, they mainly provide snapshots of the real estate sector at a given time and do not consider the dynamics of organisational change.

This paper contributes to this discussion by providing a more dynamic insight on the gradual integration of sustainability concerns by the real estate sector. In addition, it questions the role of the "green value" talk. Using the CSR communication of the 20 largest French listed real estate companies between 2008 and 2013, I explore why and how sustainability issues have been integrated into real estate practices, and wonder whether the discussion on "green value" has indeed led to organisational changes towards a more responsible real estate.

This paper is organised as follows. **Section 2** proposes a conceptual framework based on results from CSR literature and institutional theories. **Section 3** details the research question and methodology. It discusses in particular how data are collected and coded to distinguish between the different types of strategies. **Section 4** synthesises key findings on the perception of "green value", its relative importance in companies' motivations to engage in sustainable practices and the types of sustainability policies implemented. **Section 5** discusses the underlying organisational change process. In particular, it investigates whether CSR strategies stem from companies' own assessment of the financial impact of CSR or from mimetic behaviours. Last section concludes.

# 2. Conceptual framework

In order to investigate how and why real estate companies have integrated sustainability considerations into their practices, I assume that sustainability-related issues are part of the CSR policies of the real estate companies and base my research on CSR literature. First, I examine the literature on companies' motivations to engage in CSR policies and build my own classification to account for the various types of value creation strategies. I thus complete this framework using institutional theories to account for the impact of the context and examine organisational change.

## 2.1. Firms' motives to engage in CSR

Corporate Social Responsibility (CSR) refers to companies' concerns for the various social and environmental impacts they may have (Carroll, 1999). A large bulk of the literature on CSR is dedicated to why companies engage in CSR policies (theoretical or effective motives).

Colbert *et al.* (2009) classify these various motives into four categories: ensuring cost and risk reduction, gaining competitive advantage, developing reputation and legitimacy, and seeking win-win outcomes through synergistic value creation with stakeholders. These categories partially

overlap those from Carroll and Shabana (2010), which rely on the type of strategies implemented: benefits over costs, innovation and risks management, protection of reputation, and integration with broader strategies. These theoretical insights have been empirically confirmed by Bansal and Roth (2000) who derive their own classification from interviews with various companies. They distinguish between competitiveness motives which refer to firms engaging in sustainability policies to improve their profitability, legitimacy motives which refer to firms aiming to protect their reputation and maintain their "license to operate", and ecological responsibility motives which encompass more altruistic considerations.

In this chapter, I adapt this last classification since it can easily be modified and completed to account for the underlying value creation strategies. More precisely, I distinguish altruistic, economic, and legitimacy motives.

### *Altruistic motives*

Companies may engage in philanthropic practices because they reckon it is their moral responsibility and because they wish to contribute to the community (corporate citizenship). At individual level, firms' managers may deliberately choose to engage in such actions for ethical beliefs, with financial consideration being only secondary (Hemingway and Maclagan, 2004). They do not expect economic returns from their actions, other than the satisfaction out of doing good. Donations and non-publicised CSR behaviours are typical actions associated with altruistic motives (Bansal and Roth, 2000).

### *Economic motives*

Companies may engage in CSR to benefit from business opportunities. I distinguish two types of economic motives according to the type of value creation strategy.

First, companies may aim for direct financial benefits. Along these lines, CSR strategies are focused on sustainability-related criteria identified as impacting on the firms' cash flows. Efficient use of resources to cut down expenses is one example (Hart, 1995). Other strategies would encompass developing green products to reach a niche market with higher sale prices (Sen and Bhattacharya, 2001; Becker-Olsen *et al.,* 2006), gaining competitive advantage by adopting innovations earlier (Porter and Van der Linder, 1995), delaying more stringent regulations (Lutz *et al.,* 2000; Maxwell and Decker, 2006), building a positive image to attract and retain talented employees (Greening and Turban*,* 2000; Riordan *et al.,* 1997), attracting responsible investors and gaining a better access to capital (Scholtens, 2006), etc. Decision criteria to undertake such policies typically involve costs/benefits analysis and financial performance appraisals.

Second, companies may aim for long term value creation with stakeholders. Along these lines, CSR strategies target wealth creation for the community, which should eventually benefit the company itself. Stakeholder theory, a managerial theory which emphasises the role of stakeholders in corporate governance, places stakeholders' interests inside companies' objectives, and contend that creating added value for stakeholders should result in value creation for the firm (Freeman *et al.*, 2004). Using a different perspective, Porter and Krammer (2011) argue that companies should seek shared value creation by conceiving products which meet social problems and by enhancing firms'

capabilities to work with local suppliers thus fostering local development. Such strategies would entail improving the benefits for stakeholders before targeting immediate gains for shareholders.

### *Legitimacy motives*

Companies may not always manage CSR strategically. They may also be driven to adopt CSR strategies by external pressures. Companies may undertake CSR policies in order to avoid contestation and reputation issues (Baron *et al.*, 2011), to appear more trustworthy (Waeraas and Ihlen, 2009) or to imitate sectorial leaders if they reckon CSR practices have become standard (Bansal and Roth, 2000). Such behaviour is consistent with legitimacy management. Suchman (1995) defines legitimacy as companies' willingness to appear consistent with established standards, regulations or beliefs. Legitimacy may arise from external demands or from the sheer numbers of companies having already adopted said practices (Abrahamson and Rosenkopf, 1993). It does not correspond to a value creation strategy but rather to brand value protection and risk management.

## 2.2. Proposed classification of CSR motives

Based on these elements, I thus propose the following framework to analyse the main motives for real estate companies to engage in CSR policies. Four different motives associated with different value creation strategies are distinguished: altruistic motive, prospects of direct financial gains, objective of long term value creation with stakeholders, and legitimacy motives. **Table 6** synthetises the key features of these main motives. These categories are not mutually exclusive.

| | **Altruistic motives** | **Economic motives** | | **Legitimacy motives** |
|---|---|---|---|---|
| | | **Direct gains** | **Long term wealth creation** | |
| **Drivers** | Philanthropy and citizenship | Prospects of direct financial returns | Objective of value creation for stakeholders | Compliance with standards and regulation |
| **Perception of CSR** | Moral responsibility | Cost efficiency | Opportunity | External constraint |
| **Typical actions implemented** | • Donations<br>• Unpublicized social actions | • Management tools<br>• Efficient use of resources | • Innovation<br>• Collaborative actions with stakeholders | Compliance with regulation and sectorial standard practices |
| **Decision factor** | Contribution to the community | • Costs/ benefits analysis<br>• Financial calculations | Value for stakeholders | • Risk mitigation<br>• Mimetic behaviours |
| **Value creation strategy** | No return expected for the company itself | • Increasing product market value<br>• Reducing expenses | Wealth creation with stakeholders | • Risk mitigation<br>• Brand value protection |

**Table 6: Classification of firms' motives to implement CSR strategies**

## 2.3. Integration of CSR practices and institutional context

Institutional theories provide an interesting ground to examine how these motives have driven real estate companies to implement sustainable practices. They gather a wide range of theories investigating how organisations are shaped by their institutional context (i.e. norms, cultural beliefs, collective rules, etc.). In particular, these theories assert that companies may tend to adopt similar organisational structures even though their motives may differ. This convergence is referred to as isomorphism (DiMaggio and Powell, 1983).

Two types of isomorphic process are distinguished: competitive isomorphism associated with a search for efficiency, and institutional isomorphism resulting from the institutional context. DiMaggio and Powell (1983) further distinguish three sub-categories of institutional isomorphisms (see **Table 7**). Coercive isomorphism stems from a quest for legitimacy to comply with the various norms and regulations applicable. Normative isomorphism arises with the professionalization, when companies follow the various well-established practices. Mimetic isomorphism appears when companies are uncertain on the best stance to adopt and choose to imitate leading companies.

| **Type of isomorphism** | **Competitive isomorphism** | **Institutional isomorphism** | | |
|---|---|---|---|---|
| | | **Coercive isomorphism** | **Normative isomorphism** | **Mimetic isomorphism** |
| **Key driver** | Quest for efficiency | Quest for legitimacy | Result from professionalization | Response to uncertainty |

**Table 7: The different types of isomorphism processes**

Several authors (Huault *et al.,* 2006; Rubinstein, 2006; Brammer *et al.,* 2012; Avetisyan and Ferrary, 2013) have already provided evidence that CSR corresponds to an emerging institutional field, with its own beliefs, norms and organisations. As CSR emerges as an organisational field, institutional theories predict isomorphic changes in the way companies should integrate CSR. Rubinstein (2006) asserts that the quest for efficiency is not sufficient to explain why companies increasingly engage in CSR and reckon that institutional isomorphisms, in particular legitimacy, play an important part in CSR development. Similarly, Campbell (2007) and Miller and Guthrie (2007) highlight the strong normative call for CSR behaviours, and point out the institutional context rather than the strategic analysis of the associated the benefits as the main driver of the adoption of CSR policies.

In addition, the institutional context may also strongly affect the success of the various CSR strategies. Bansal and Roth (2000) suggest that field cohesion and close competition could foster CSR policies arising from legitimacy motives but could be detrimental to strategic CSR. Indeed, in this last situation, imitation would limit the advantages of leading companies. More globally, economic-driven CSR can only bear fruit if the companies are "rewarded" for acting responsible (through lower costs, higher prices, or long term higher value for example). This may not happen if stakeholders have high expectations but low willingness to financially reward responsible behaviours (Quairel-Lanoizelée, 2011) or if leading companies are largely imitated by companies driven by legitimacy concerns (Orlitzky *et al.*, 2011). Moreover, as the belief that CSR impacts economic success spreads, more and more firms may be tempted to adopt similar organisational patterns independently of their own beliefs on the impact of CSR on financial performance (CSR "business case).

### 2.4. Initial hypotheses

Based on this literature review, this article postulates that all real estate companies should progressively adopt sustainable policies as sustainable real estate becomes an institutionalised field. In consequence, there should be a convergence (at least superficial) in their sustainability practices, even though they may hold dissimilar beliefs and motivations.

The initial assumption is that the rhetorical talk on "green value" stemming from academic publications has triggered an apparent quest for the "value grail", legitimating sustainable real estate. If sector leaders have developed value creation strategies embedding sustainability in their organisations, the development of sustainability policies within the real estate sector is mainly driven by institutional isomorphism.

## 3. Methodology

### 3.1. Research strategy

This paper explores how the real estate sector has been impacted by the debate on the financial performance of sustainable real estate (more commonly referred to as "green value"). Is green value a key motive for companies to shift their business model or is it merely "green talk" to disguise behaviours primarily driven by the institutional context?

To investigate the role of "green value" in companies' willingness to engage in sustainable practices, I analyse the public communication of the 20 largest French listed real estate companies (sustainability reports and/or dedicated CSR section in annual reports) from 2008 to 2013. [21]

First, I analyse the companies' declared motivations to engage in CSR policies according to the conceptual framework developed in **Section 2**. This helps me identify how economic motives rank among firms' motivations to implement sustainable practices and how this ranking has evolved over time. In addition, I investigate how these motivations result from the "green value" talk, by examining all references to value creation strategies stemming from sustainable practices.

Second, I examine how sustainability is managed by companies. To do so, I explore the tools and resources dedicated to CSR strategies and their time evolution over time. This helps me question to what extent sustainability considerations are embedded in firms' organisation.

Third, I discuss the organisational changes that occurred, using results from institutional theories. I expect the number of companies driven by economic motives to increase with the publication of green value studies, and the number of companies driven by legitimacy motives to increase with the

[21] Unibail-Rodamco, Klépierre, Gecina, Icade, Altarea-Cogedim, Foncière des Régions, Société Foncière Lyonnaise, Mercialys, Foncière des Murs, Foncière Développement Logements, Eurosic, ANF Immobilier, Société de la Tour Eiffel, Siic de Paris (Siic de Paris 8ème before 2012), Foncière de Paris (Foncière Paris France before 2013), Cégéréal, Argan, Affine, Foncière des 6ème et 7ème arrondissements de Paris, Terreis.

number of companies having already adopted CSR strategies. In addition, I expect companies merely driven by legitimacy motives to eventually adopt similar resources than those driven by economic motives, but with a smaller level of integration in core practices.

## 3.2. Data

Justifications for using CSR communications are three-folds. First, relying on public information allows me to identify how companies spontaneously present their CSR policy and what key features they deem important enough to highlight to their stakeholders. Second, CSR communication is deemed a reliable source of information for this analysis since all French listed companies are legally bound to report on sustainability topics in accordance with the Grenelle 2 Act. The regulatory context requires companies to report on a list of sustainability topics and to submit this information to third parties verification. The list of topics includes the organisation of the company to take into account CSR issues, the use of natural resources (waste, water, energy, etc.), the relations with stakeholders, etc. Third, CSR communication may be analysed as part of CSR management. CSR communication coincides with the trademarks provided for management tools by Chiapello and Gilbert (2013). It has an organisational target: meeting legal requirements and communicating non-financial performance to analysts and investors who may use them in their investment process. It contains a tangible structure, with the production of a CSR report synthesising key data. Last, it has a process dimension with professional guidelines on how to compile sustainability metrics and how to present information[22]. As management tools, their structuring may inform readers on the level of maturity of companies on the topics reported. In this regard, the balance scorecards disclosed are particularly relevant.

The CSR communications of the sample are examined using a thematic analysis. All associated references to sustainable practices as regards building development and management are systematically collected. Broader CSR strategies at the firm level (overall governance, social policies with employees, etc.) are not considered. References are coded after an iterative process to finalise the different relevant dimensions and associated themes (Saldaña, 2012). Coding for companies' motivations stems from the categories highlighted in the literature review, whereas coding for practices stems from an exploratory approach. The four following topics are considered:

1. **Firms' motivations to engage in sustainable real estate**

Motivations are analysed using the four categories highlighted in the conceptual framework: altruistic motives, prospects of direct financial gains, objective of long term value creation and legitimacy motives. Since companies may have several motives to engage in CSR, frequency counts are also utilised to determine the relative importance of each motive. A scoring from 0 (no related occurrence) to 3 (numerous occurrences) is thus used to determine the dominant motive. This rough frequency coding was selected since the size and type of data analysed for each company may vary (size of dedicated CSR reports and dedicated sections in annual reports for example).

[22] See in particular the supplement on the construction and real estate sector from the Global Reporting Initiative (GRI CRESS), and the guidelines from the European association of listed real estate companies, EPRA Sustainability Reporting Best Practices Recommendations (EPRA sBPR).

**2. Perception of the impact on value creation**

The perception of the impact of sustainable real estate on value is explored through two means. First, I analyse the types of benefits companies associate with sustainable real estate. I examine whether no impact on value is mentioned or whether one or several of the following benefits are mentioned: optimizing costs, creating additional use value, improving asset market value, and enhancing firm' s value. These categories of benefits where obtained after a first exploratory phase. Second, I explore companies' awareness on "green value" by collecting references to related studies and results. Last, I examine references to sustainability in the description of their value creation strategies.

**3. Level of maturity to tackle sustainability issues**

To investigate the level of maturity on the implementation of sustainability policies, I examine the existence of commitments to improve the sustainability performance of buildings, as well as the presentation of clear action plans with matching resources to ensure their implementation (monitoring tool, decision making process, etc.). This leads me to consider: certification schemes, CSR performance mapping (instant snapshot), CSR performance monitoring, efficiency measures for resource consumption, balanced scorecards, and publicly disclosed performance targets. Maturity is thus rated from 0 (no tools in place) to 3 (internal procedure fully in place with balanced scorecards and publicly disclosed targets on more than five sustainability topics).

**4. Level of integration into firms' organisation**

To investigate whether the sustainability is embedded in the core organisation of companies, I examine to what extent the management of sustainability topics rolls out from top managers to operational teams. I thus search for references on the existence of dedicated CSR teams, support contacts within operational teams, dedicated committees involving top managers, in-house trainings on CSR topics, and internal procedures. Level of integration into firms' organisation is thus rated from 0 (no dedicated resources) to 3 (dedicated resources fully from broad member to operational staff).

# 4. Main statistical results

This section presents key findings from the longitudinal analysis of the CSR communications. Similarly to other sectors, philanthropic actions disconnected to companies' core activities and social data on the staff are mentioned. However, the bulk of the communication consists in the attempt by companies to prove that they contribute to the development of a sustainable real estate. Companies present how they integrate sustainability-related criteria during the various stages of the building life cycle: delivering sustainable buildings, implementing sustainable management systems for existing buildings and refurbishing with sustainable features. This confirms the relevance of an approach based on CSR strategies to investigate sustainable real estate.

## 4.1. Green, sustainable or responsible real estate?

The terminology used to describe sustainable real estate varies greatly from one company to the next and reflects variations in the scope of issues covered. For example, companies referring to "sustainable buildings" usually presents policy targeting competitive advantage with tenants (increased customers' satisfaction) in an evolving regulatory context. Companies referring to "responsible real estate" emphasises their duty to contribute to society. They tend to consider a broader scope of issues. In addition to the direct environmental impacts of their buildings under management (energy, greenhouse gas emissions, waste, water), they also tend to take into considerations indirect impacts associated with building life cycle (embodied energy and materials) and various social concerns (indoor comfort, integration within the neighbourhood, connectivity, etc.).This result is consistent with Kimmet (2009), who concludes that even though "socially responsible real estate" and "sustainable real estate" are often used interchangeably, socially responsible real estate tends to evoke a broader scope of issues.

As regards time evolution, companies tend to first refer to "green buildings" with a main focus on energy and environmental risks. They then move on to "sustainable buildings" with a broader scope of environmental issues considered, before referring to "responsible real estate" which also tend to encompass more social concerns. This trend towards "responsible real estate" is clearly advocated by the French professional working group RBR 2020 in charge of making recommendations for the future regulation[23] on sustainability topics for buildings.

## 4.2. Legitimacy and economic motives as key drivers of sustainability policies

Several justifications are simultaneously mentioned by companies engaging in sustainable real estate (see **Appendix 2** for more details).

Legitimacy motives stand out when companies contextualise their policies with the presentation of the various legal requirements (mandatory disclosure, building codes, and miscellaneous technical regulations) and market standards (labels, certifications schemes, non-financial ratings, etc.). In particular, certification schemes and labels are presented as necessary to ensure attractiveness for tenants. Complying with voluntary reporting frameworks (GRI CRESS, EPRA sBPR) as well as obtaining good ratings from non-financial agencies are presented as requirements to ensure investors' and analysts' trust. Sustainable practices are thus often described as an "*essential prerequisites in the French real estate sector*". In this context, they merely correspond to a response to external requirements and shifting expectations.

Seeking positive economic returns is the second justification stream most mentioned by the sample. It relies on a perception of sustainable practices as business opportunities. On the short term, companies allude to two main mechanisms. First, they mention the expenses reduction resulting from the optimisation of building operation (e.g. energy and water costs savings). Second, they mention the improved marketability and sometimes higher asset value of certified buildings. On the long term, some companies mention that innovation opportunities could enable them to gain a competitive edge in a context of shifting stakeholders' expectations and more stringent regulations.

[23] For more details see : http://www.planbatimentdurable.fr/lancement-du-blog-rbr20202050-fr-a780.html

Moral responsibility is mentioned through the acknowledgment that companies wield power in the community, since they impact local economic development (providing local employment, shaping neighbourhood, etc.) and contribute to shape cities and urban development. In particular, some companies reckon they are "*morally bound to contribute to the community*" to explain why they adopt clear stances on environmental and social issues not covered by regulation.

Synergistic value creation is more and more mentioned over time, but references remain limited to a small number of companies. They refer to the value that sustainable real estate could entail for their stakeholders (improved use value for the tenants, positive spinoffs for the local authorities aiming to revive neighbourhoods, etc.). Along these lines, value creation is presented as a "*collaborative co-construction".*

Overall, legitimacy is the motive most frequently mentioned by the sample (see **Figure 6** and **Appendix 2**). In 2013, this motive is mentioned by virtually all the companies and is prevailing for more than half of the sample. References to economic motives have slightly increased over the 2008-2013 period. Conversely, moral responsibility, which used to be a prevailing motive in 2008 for 30% of the sample, has gradually been less and less mentioned over the years.

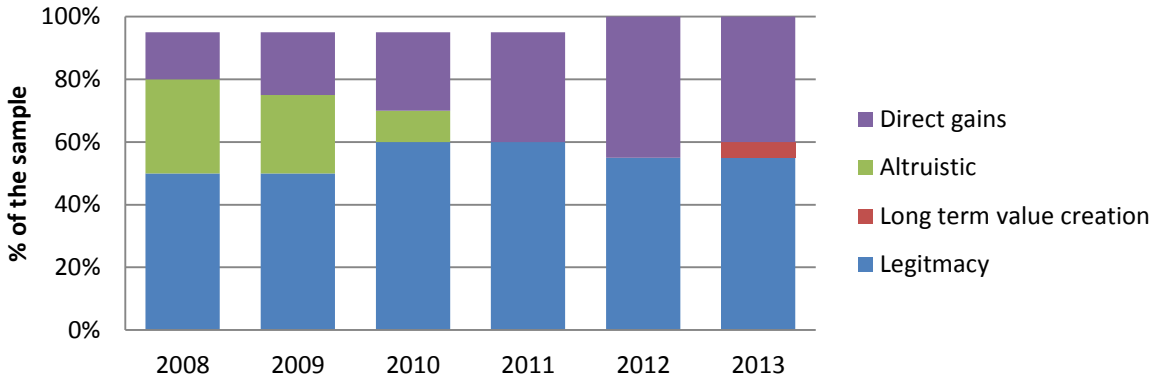


**Figure 6 : Breakdown of the sample according to companies' prevailing motivation to engage in sustainable real estate**

## 4.3. Value creation strategies associated with the different motives

To better examine the importance of the "green value talk", this sections presents in more details the different references to value creation strategies mentioned in association with CSR policies.

Companies refer to different types of value creation mechanisms associated with sustainable real estate (see **Figure 7**). Most references concern asset value (and more generally market value, rents and vacancy duration). If several companies mention that sustainability performance upgrades have helped improve asset value or asset marketability, references remain vague. Some of them allude to case studies, but none presents more precisions. Over time, companies also tend not to dwell on the specifics and increasingly mention impacts on their corporate value as a whole. They also increasingly allude to non-financial gains, referring in particular to the additional use value for tenants. For example, some companies mention the value resulting from the increased comfort conditions or from the improved adaptability of the office space.

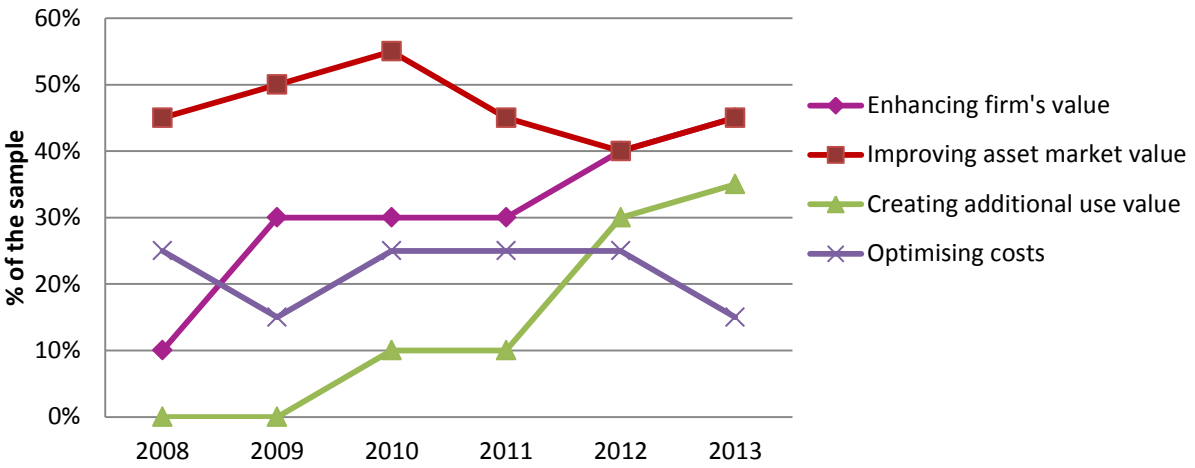


**Figure 7: References to value creation associated with sustainable real estate**

In addition, several companies point out the difficulty difficult to assess green value: "*The percentage of this value creation attributable to green value is still difficult to estimate since several parameters cannot be quantified or costed (health, productivity, image, etc.)".* Most references to value creation at building level thus remain vague. As presented in **Figure 8**, companies rather mention generic references on the benefits associated with sustainable buildings. Interestingly, in 2010, the year of the publication of professional studies on green value[24], the number of references is the highest. However, in 2013, only 5% of the sample presents the mechanisms at stake or quotes existing publications. Conversely, 25% of the sample mentions the undertaking of their own studies, usually in collaboration with academic research teams. There may be several explanations to this evolution. First, companies may have become sceptical on the existing literature and seek further clarifications by undertaking their own studies on their own assets. Second, with sustainability topics becoming mainstream, companies may have reckoned that the importance of sustainable real estate no longer needed to be emphasised. These interpretations will be discussed further in **Section 5**.

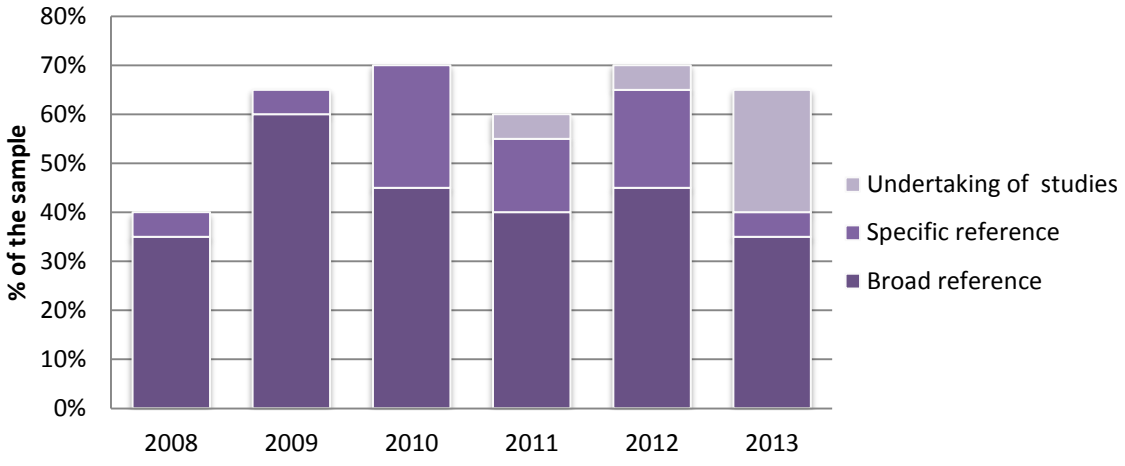


**Figure 8 : References to value creation associated with sustainable real estate**

[24] Report from the Green Value working group of Plan Bâtiment Grenelle, coordinated by Meka Brunel and published in 2010. Plan Bâtiment Grenelle, renamed in 2014 Plan Bâtiment Durable, is a mission charged by the French Government to facilitate the implementation of the Grenelle Acts in the construction and real estate sector, and in particular to pilot the energy efficiency plan for the sector.

Unsurprisingly, **Figure 9** confirms that companies mainly motivated by financial gains and synergistic value creation are more likely to put forward value creation strategies associated with the implementation of sustainable real estate. In addition, they more frequently refer to use value, corresponding to the additional value bestowed by sustainability on the occupiers of sustainable buildings (improved comfort, improved satisfaction, etc.) and are more frequently undertaking their own studies to investigate further these aspects.

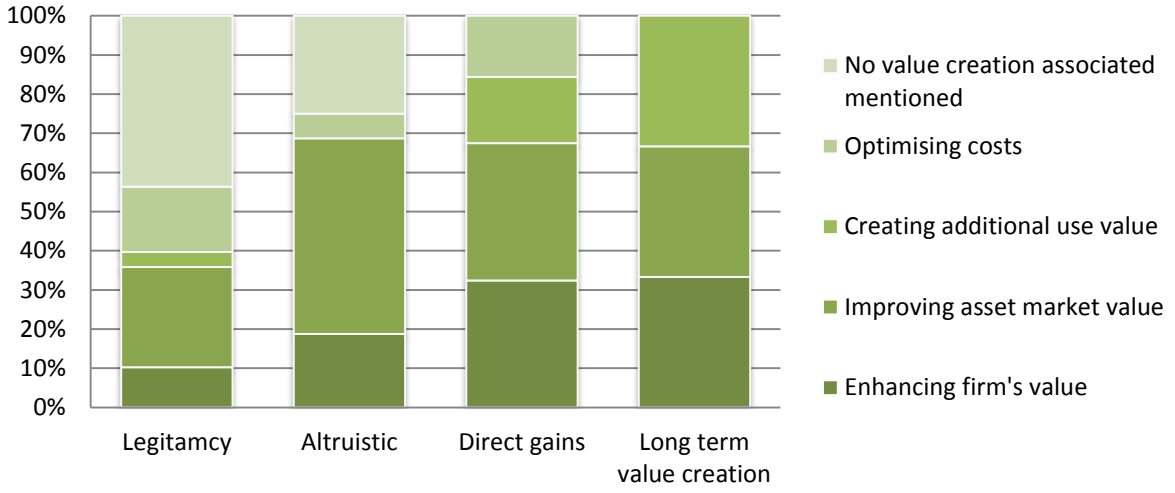


**Figure 9 : Type of value creation strategies mentioned according to prevailing motivation to engage in sustainable real estate**

By and large, very few companies communicate on explicit references to value creation and financial gains. These results are consistent with those by Attuyer *et al.* (2012), who report that during interviews, asset managers and investors had difficulty providing evidence on the added value associated with sustainability-related features. Several elements may explain the absence of explicit references to value creation. First, professionals may be cautious to refer to added value in the absence of definite evidence from the market. They rather discuss risk mitigation and long term impacts which is more generic and less binding. Along these lines, legitimacy and financial gains correspond respectively to the pessimistic and optimistic facets of a same target: maintaining the long term companies' prospects in a changing context. Second, it is probable that several companies with no dedicated CSR staff have not adopted a definite position, but rather act in a mimetic fashion. These possible explanations will be investigated further in **Section 5**.

## 4.4. Convergence in the types of organisation adopted by companies

This section presents the evolution of the management tools, the performance targets publicly disclosed and the types of organisations adopted by the sample to implement sustainability-related practices. Results suggest that CSR (or at least environmental criteria) is becoming an essential part of leading management practices in real estate. Further details are provided in **Appendix 3**.

**Figure 10** synthesises the types of management tools that are used. In 2013, all companies within the sample mention using certification schemes, and virtually all exhibit the percentage of their portfolio with sustainability credentials. Most of them emphasise how such schemes have become "*inescapable concerns*" and "*standard practices*". New buildings are purchased with sustainability

credentials and in-use labels are considered for asset under management. As regards the management of existing buildings, environmental metrics are presented both as a legal obligation (Grenelle 2 Act) and as a prerequisite for the implementation of good management practices. As a first step, companies appear satisfied with a mapping of their assets (performance snapshots at a given time). However, this practice seems to decline over time in favour of a more dynamic monitoring of environmental metrics (through invoices collection and meters). As policies become more structured, balanced scorecards are increasingly used to monitor actions plans and their results on key performance metrics. The share of the sample using balance scorecards thus jumped from 10% in 2008 up to 55% in 2014, simultaneously with the public disclosure of performance targets. Performance targets are mainly focused on the share of certified buildings inside portfolios and the reduction of energy consumption. Example of targets includes reducing energy consumption by 25% between 2012 and 2020.

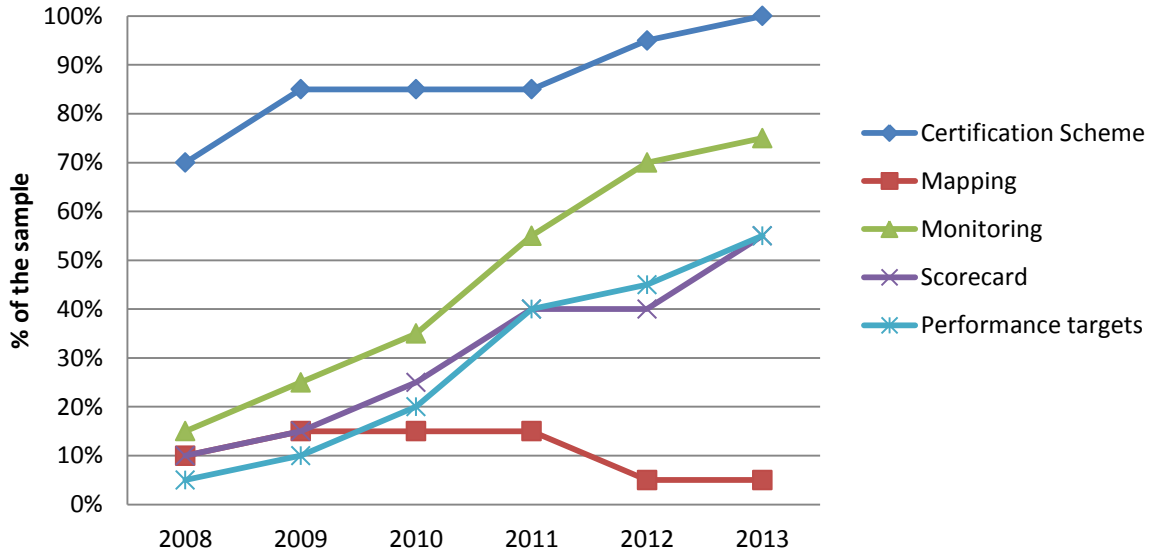


**Figure 10 : Types of management tools used by the sample on CSR issues**

On the whole, practices seem to converge from various disparate actions to more structured policies with performance targets monitored over time. The types of organisations adopted to implement these actions plans also seem to converge, as suggested in **Figure 11**. Instead of keeping CSR considerations separated from their core activities, companies tend to gradually internalise CSR issues into their daily operations by training operational staff, organising committees with top managers, and creating internal procedures dedicated to the systematic integration of environmental issues (energy, water and waste in particular). Although motivations may differ, companies tend to gradually adopt the same practices. CSR considerations are increasingly integrated into organisations. They are described as best management practices to optimise building operations, and anticipate tenants and regulatory bodies' shifting expectations.

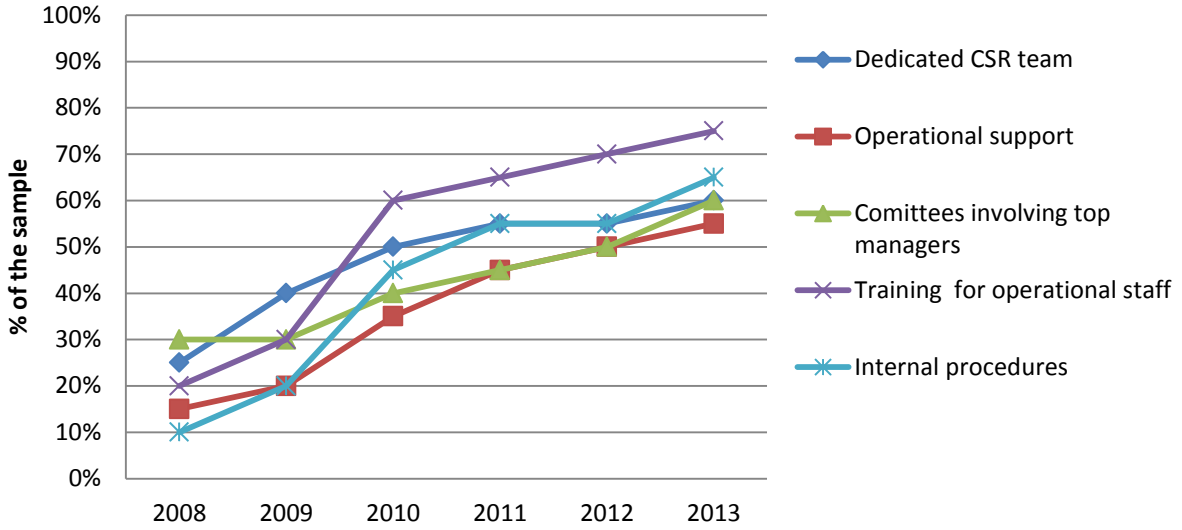


**Figure 11 : Types of organisation adopted to tackle sustainability-related issues**

All companies have not achieved the same level of integration of sustainability-related issues. Companies motivated by financial gains and value creation prospects seem to race ahead (see **Figure 12**).

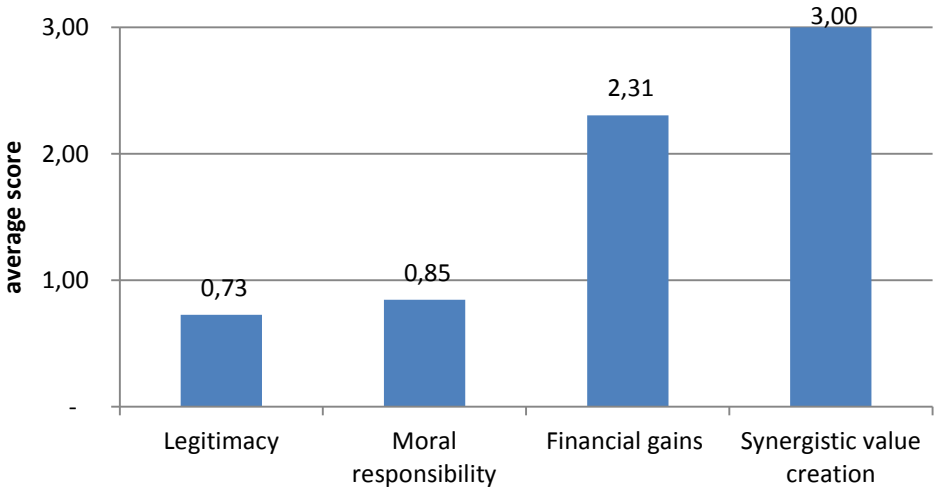


**Figure 12 : Average level of integration (score from 0 to 3) according to the prevailing motivation**

To summarise, over time, virtually all companies have gradually acknowledged the importance of sustainable practices for their assets and ultimately corporate value (either for value creation or for value protection). Although, the level of integration of sustainable practices into core organisations varies, there seems to be a convergence in the type of organisations adopted. This result supports the hypothesis formulated in **Section 2** regarding the institutionalisation of sustainable real estate and its underlying isomorphic process.

# 5. Change processes in the integration of sustainable practices

This section investigates further this apparent convergence in the implementation of CSR practices. First, complementary analyses are conducted to verify previous findings. Results from **Section 4** were obtained from an analysis at a statistical level. They may conceal different time patterns from one company to the next. An analysis of individual change patterns is thus completed to examine in more depth organisational change processes. Second, findings are interpreted using results from institutional theories developed in **Section 2.**

## 5.1. Organisational change processes

In order to investigate whether similar patterns can be identified in the way companies have integrated sustainability-related issues, the individual time sequences of prevailing motivations and management tools used are examined for each company within the sample from 2008 to 2013. These sequences are thus interpreted using institutional theories, and literature on organisational change. Change process can be defined as "*a progression of change events that unfold during the duration of an entity's existence*"(Van der Ven and Poole, 1995, p.512). They can be examined using a "*process narrative"* method, through the description of how change unfolds (Van der Ven and Poole, 2005). Full results are presented in **Appendix 4**.

Findings confirm the analysis resulting from aggregated statistics completed in **Section 4**. The observation of the sequences of prevailing motives for each company suggests that 90% of the companies within the sample follow a pattern consistent with the process described in **Figure 13.**

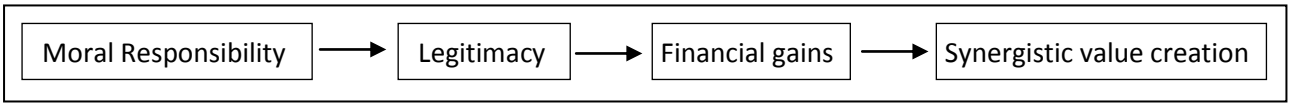


**Figure 13: Sequence of prevailing motivations**

Similar analyses are conducted for the tools used by companies to manage CSR issues. The order in which companies adopt the various management tools to integrate CSR considerations is consistent with the pattern illustrated in **Figure 14**.

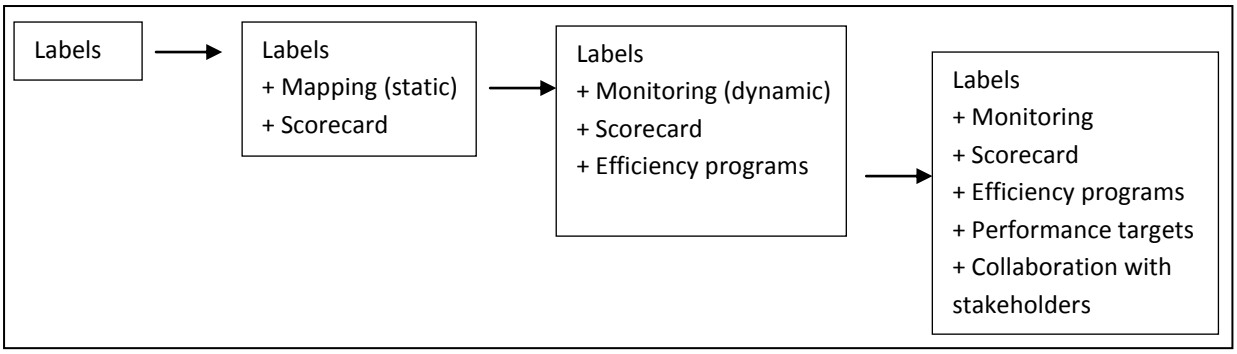


**Figure 14: Sequence of adoption of management tools**

The sequences obtained are similar to the "life cycle model", proposed by Van der Ven and Poole (1995) as one of the four ideal-type developmental theories for explaining processes of change in organisations. According to this ideal model, change process is guided by immanent rules even though external events can influence it to some extent. The prevailing motives and types of management tools implemented seem to evolve as companies gain maturity on the topic.

Sustainability-related topics seem to be gradually integrated into companies' organisation from a stand-alone issue to a transversal concern, according to the four stages highlighted in **Table 8**. These stages are consistent with the theoretical change framework described by Greenwood *et al.* (2002).

| | Stage 1 | Stage 2 | Stage 3 | Stage 4 |
|---|---|---|---|---|
| **Stage** | Emergence of awareness | Appraisal of the situation of the firm | Structuring of a policy | Integration into core practices |
| **Driving motive** | Moral responsibility (leader)<br>Legitimacy (laggard) | Legitimacy | Legitimacy<br>Financial gains | Financial gains<br>Long term value creation? |
| **Policies** | Punctual actions | - Labels and certification schemes gradually systematised<br>- Performance mapping to meet disclosure requirement | - Labels and certification schemes systematically<br>- Performance monitoring to meet both disclosure requirement and efficiency purpose<br>- Balanced scorecard | - Labels and certification schemes systematically<br>- Performance monitoring<br>- Balanced scorecard<br>- Performance target |
| **Organisation** | Environmental risk manager | Dedicated CSR team | - Dedicated CSR team<br>- Top manager involved in CSR committees<br>- Traineeships for the staff | - Transversal CSR team<br>- Top manager involved in CSR committees<br>- Traineeships for the staff<br>- CSR support contact within operation teams |

**Table 8: Structuring of sustainability-related topics within real estate companies**

First stage corresponds to companies gaining awareness on CSR topics. This awareness may occur due to moral concerns or external pressures. Companies attempt punctual actions to gain experience.

Second stage consists in companies starting to tackle said issue. They start mapping the sustainability performance of their portfolio to identify potential levers for improvements. Policies are focused on labels and data collection. For laggards, these actions are rather driven by mandatory non-financial disclosure regulation (Article 225 of the Grenelle Act), and market standards as regards labels and certification schemes. At this stage, practices are not formalised into a policy, and do not aim to improve management process. This stage corresponds to the pre-institutionalisation stage described by Greenwood *et al.* (2002) with companies testing new practices and gaining an understanding on the topic.

Third stage is characterised by the structuring of sustainability policies in response to the external pressures but also to create business opportunities. Companies examine financial prospects, in particular efficiency programs as a means to reduce expenses. Policies usually focus on "material" topics, meaning issues having a financial impact easily identifiable for the company. Companies start developing internal process and modifying their organisation to embed sustainability-related issues in their daily practices. This stage corresponds to the theorization and diffusion stages described by Greenwood *et al.* (2002). Companies acknowledge current organisational failings to meet with the new requirements and "objectify" (i.e. formalise) new practices.

Fourth stage corresponds to the full integration of sustainability-related issues into daily operations through structured policies and internal process. Performance targets are set, and objectives are

passed on to operational teams as core objectives. This stage corresponds to the re-institutionalisation stage described by Greenwood *et al.* (2002), with the new organisational form gaining a cognitive legitimacy. In addition, some companies seek new approaches to bypass the contradiction between the financial rationale and sustainability challenges through more radical shifts in the business models. Among leading companies, there thus seems to be the emergence of policies aiming for long term value creation with stakeholders and extending the scope of issues covered. If a shift in rationale is indeed found, this could lead to a fifth stage towards a more ambitious re-institutionalisation.

The pace by which these stages unfold varies across companies according to how they respond to the institutional context. Greenwood and Hinings (1996) oppose radical change corresponding to a complete reorientation of the organisation, to convergent change corresponding merely to a "*fine tuning of the existing orientation*". Most companies in our sample are still struggling with the second and third stages, which do not require a reorientation of existing practices. As such, sustainable real estate is indeed more a response to the normative call within the existing financial rationale, than a reorientation towards a new model of value creation. The jump towards a fifth stage involving a more complete reorientation would require companies to shift their value paradigm from financial gains to synergetic value creation with stakeholders. If a few leading companies seem to hint at this reorientation, a lot is still required to make this transformation come true.

## 5.2. Professionalization, mimetic behaviour or mantra?

The analysis of the institutional context of sustainable real estate confirms that all conditions are reunited for the emergence of an institutional field, with the presence of coercive, normative and cognitive institutions as well as uncertainty on the market evolutions. **Table 9** illustrates this institutional context.

| Process | Coercive | Normative | Mimetic | Cognitive |
|---|---|---|---|---|
| **Institutional context** | • Mandatory disclosure on ESG performance<br>• Building code, and environmental regulation | • Guidance from professional bodies: WGBC, RICS, UNEP FI PWG, etc.<br>• Voluntary certification schemes: HQE, BREEAM, LEED, etc.<br>• Non-financial ratings: GRESB, etc. | Best practices from sector leaders | Rise of sustainability topics.<br>"Green value" talk |
| **Driver** | Compliance with regulation | Professionalization | Uncertainty on the context and its impact on firms' value | Shared belief |

**Table 9: Institutional context of sustainable real estate**

### *Regulatory pressure as a starting point*

Various standards and norms exist in the real estate sector. At building level, regulation primarily targets energy performance through the building code. However, this regulation still mainly focuses

on new buildings and retrofits. For existing buildings, the law sets energy reduction targets by 2020. However, in the absence of enacting decree, the regulatory goals are not binding. At corporate level, Article 225 of the Grenelle Act 2 and its enacting decrees requires large or listed companies to disclose non-financial information on 42 environmental, social and governance topics. However, the regulation does not specifically require companies to disclose sustainability metrics. By and large, the regulatory context alone cannot fully explain the fast adoption of sustainability policies reaching beyond current legal requirements.

### *Professionalization reaching beyond legal requirements*

Sectorial standards and guidelines set more global frameworks for sustainable practices in real estate. However, these standards still more correspond to normative calls on the process to be implemented than requirements for the actual improvement of the sustainability performance.

At building level, labels and environmental certification schemes (e.g. HQE, BREEAM, LEED, etc.) represent voluntary schemes which have become market standard for the real estate investment market. In 2013, three fourths of the new office buildings over 1,000 sqm were certified[25] in the Greater Paris Region. However, certification schemes have been criticised, in particular due to the unreliable in-use performance of certified buildings (Carassus, 2011). At portfolio and corporate levels, non-financial analyses provide an incentive for companies to communicate on global sustainability policies and sustainability metrics beyond legal requirements. They are used by responsible investors wishing to invest in companies with the best sustainability practices. International and sectorial reporting initiatives such as GRI CRESS or EPRA sBPR[26] provide frameworks for the disclosure of sustainability metrics on real estate portfolio and buildings. However, these normative standards do not require improvements on the actual sustainability performance. Last, the creation of specific courses, specialised training, dedicated associations, as well as sustainability working groups within existing professional bodies (World Green Building Council and its national branches, Sustainable Building Alliance, Observatoire de l'Immobilier Durable, etc.) represent also an attempt at professionalization.

### *Mimetic behaviours to answer the uncertainty associated with a shifting context*

However, sustainable real estate is still an on-going trend. Regulation and certification schemes are swiftly evolving. For example, the HQE environmental certification scheme has undergone a dozen or more modifications since its creation in 2005. Stakeholders' expectations as regards sustainability are not exactly known, and companies are still unclear on the extent tenants will reward them for sustainability-related features. In addition, regulatory requirements are continuously evolving, and decrees implementing objectives set in orientation Acts are not always enacted. Overall, there is still much uncertainty about the evolution of the context and its potential impacts on asset value. These elements are strong factors for companies to assume mimetic behaviour to align (at least superficially) their practices with those of leading companies.

[25] Deloitte, Office crane survey summer 2013).

[26] supplement on the construction and real estate sector from the Global Reporting Initiative (GRI CRESS), and guidelines from the European association of listed real estate companies, EPRA Sustainability Reporting Best Practices Recommendations (EPRA sBPR).

### *Mantra repeated by professionals to transform reality*

This institutional context still does not explain why companies endeavour to present sustainability as part of their value creation strategy if legitimacy is their prevailing motives. I suggest that companies communicate on the value creation associated with sustainable real estate as a means to provide a financial rationale for sustainable practices, and to make the potential benefits come true by raising awareness among stakeholders (and shareholders in particular).

The analysis of public communications indeed shows that references to value creation are mostly used as background elements in the introductory sections of CSR reports. They aim to justify why companies are undertaking sustainability policies by aligning financial imperatives with sustainability practices in an uncertain context. In particular, companies emphasise that the real estate sector is undergoing a tremendous shift as regards sustainability-related concerns. For example, one of the reports states: "*Real estate is, therefore, right in the midst of considerable change affecting all aspects of the industry as well as society as a whole, in both cities and regions and all stakeholders".* CSR strategies thus appear as necessary for companies to adapt to an evolving context. A lexical analysis of the introductory paragraphs confirms this analysis. Companies' stance towards sustainability is described with expressions such as "*conviction*", "*anticipation*", "*necessity*", etc. Companies seem to want to convince and mobilise support. The "green value" talk is used to justify the implementation of sustainability practices, when the institutional context to do so remains vague and uncertain. In addition, highlighting the business case also allows companies to raise awareness among their stakeholders and incite these players to reward them for their sustainability-related endeavours. For example, if investors acknowledge that sustainability practices impact companies' value, they could choose to invest preferably in companies with best sustainability practices, hence creating a competitive edge for leading companies.

The "green value" talk in CSR communication may thus be assimilated to a professional mantra, a performative belief which diffusion contributes to its effective realisation. It provides a solution to the contradictions between the financial rationale and the institutional pressure in favour of sustainable real estate, and offers companies a rhetorical tool in their quest for the protection of their long term value. This explanation is consistent with the cognitive-based form of legitimacy identified by Suchman (1995).

# 6. Conclusion

Since 2008, French real estate companies have increasingly acknowledged the value of sustainable real estate. In their public communication, they present value creation (or the protection of long term value) as a key driver for their sustainability-related policies. However, they remain cautious, and usually merely highlight that energy performance and certification schemes upgrades have become market standards. A close analysis of companies' practices and resources dedicated to sustainability-related topics shows that for most companies, sustainable practices seldom exceed collecting environmental data and obtaining sustainability credentials for their new buildings and retrofits.

This gradual integration of sustainability-related issues into real estate stemmed from the institutional context with regulatory pressure as a starting point. This led to a standardisation of practices going beyond legal requirements due to a professionalization of the sustainable real sector (through best practices, sustainability credential, professional organisations dedicated to sustainability, etc.). The diffusion of these practices has been accelerated by mimetic behaviours in a context of uncertainties on the impacts of these evolutions. In this context, the « green value » talk appears more as a collective mantra than a true driver. It legitimates the undertaking of sustainability-related policies going beyond legal current requirements in a context on uncertainties on future regulations and market conditions. In addition, as a performative belief, its diffusion contributes to its realisation. The adhesion of stakeholders (in particular shareholders and occupiers) may ensure that sustainability performance indeed command a higher value for real estate companies with stakeholders effectively rewarding them for their sustainability policies.

Most companies are still struggling with the first steps of the integration of sustainability-related topics into their organisations. They conform to the letter rather than the spirit of the changes taking place by imitating practices from sectorial leaders. However, some of the leading players have started to integrate sustainability-related issues more fully into their value creation strategies in relations with the creation of additional value for their stakeholders. Deeper shifts in the practices could thus occur. On the whole, two future scenarios could unfold. On the one hand, sustainable real estate may merely remain another requirement in the existing context, with only superficial adjustments to existing organisations and practices. On the other hand, the integration of sustainability into core organisations may trigger a shift in paradigm in the relations with stakeholders through the development of joint value creation. This would require shifting from a mere “financial rationale” to the integration of intangible issues into decision processes.

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# Appendix 1: The diffusion of the concept of "green value"

As a first approximation, Google counts are used to monitor the use of the expressions "green value" and "brown discount" associated to the rise of sustainable real estate.

First occurrence dates back to 2004 in an urban context, but the expression really kicked off in 2005 with a RICS report entitled "*Green Value: green buildings, growing assets*". It is stated in the introduction that "*Green Value was thus crafted to assess whether sustainable practices make money or not*"(RICS, 2005). However, the concept remains vague. One of the main issues discussed is that the "value" may be interpreted differently according to industries and job positions. "*At the heart of the debate over the linkage between green buildings and asset value itself are the different notions of what constitutes 'value'. There is a substantial but, we suggest, surmountable hurdle to be overcome. This is the gap in understanding and knowledge that exists between the green industry and the financial industry, in particular the valuers/appraisers who advise companies, pension funds, banks, insurers and others on the investment side of real estate.*" (RICS, 2005)

In the following years, an increasing number of academics have referred to green value when investigating the financial benefits of sustainable buildings. Different types of research projects have co-existed. Some authors have investigated the existence of a price premium for certified buildings compared to non-certified buildings thanks to transaction data. One of the earliest references comes from a working paper by entitled "*Green Noise or Green Value? Measuring the Price Effects of Environmental Certification in Commercial Buildings*" which underwent various versions before its publication in the journal *Real Estate Economics (*Fuerst and McAllister, 2011). The authors do not define the expression "green value", which is only used as a rhetorical figure in the title. In the following years, a large number of working papers and publications investigated the empirical links between market value and financial performance of sustainable real estate (Wiley *et al.,* 2010; Eichholtz *et al.,* 2010; etc.). Other authors assessed the potential benefits of green buildings investigating the total costs and benefits induced for all stakeholders (Kats e*t al.*, 2003; Muldavin, 2010; WGBC, 2013). Last, different research projects discussed possible methodologies to integrate sustainability criteria into decision-making process and valuation exercises (see for example Lorenz and Lützkendorf (2007, 2011), Ellison *et al.*(2007), Popescu *et al.*(2009) Runde *et al.*(2010),etc.). Overall, few authors actually referred to the expression "green value" in more than the introduction. Since 2010, references to "brown discount" have also been increasingly used to highlight that the premium for high sustainability performance may transform into a discount for poor sustainability performance.

Progressively, results from these academic studies have spread among professional publications (institutional studies[27], market insights[28], etc.) focusing on practical implications for the sector. The normative stance adopted by most documents appears clearly in the type of verbs used in reference to green value: "*identify*", "*assess*", "*appraise*", "*comprehend*", "*integrate*", etc. Spreading academic

[27] The expression is used by international valuation bodies (RICS, The Appraisal Institute…). In France, the translated expression "valeur verte" is for example used by Plan Bâtiment Durable (body in charge of the implementation of the Grenelle 2 Act in the real estate sector) for a working group (2009-2010) and for a summary document (2013) (see http://www.planbatimentdurable.fr/valeur-verte-r155.html)

[28] Jones Lang Lasalle (2011) On Point L'immobilier Durable. Avril 2011.
Jones Lang Lasalle (2012) On Point L'immobilier Durable. Avril 2012.
DTZ (2013) Investissement vert en France. DTZ Insight Serie. May 2013

results is presented as a first step towards the deeper incorporation of sustainability since it should convince professionals to voluntarily modify their practices. The French certification body Cerqual (2011)[29] uses a synthesis on main results for residential buildings to discuss shifts in the sector to ensure the occurrence of a price differentiation between sustainable and non sustainable buildings. French public organiqation for the promotion of sustainable practices, Ademe (2011)[30] illustrates the existence of a price premium through case studies in order to encourage owners to engage in sustainability retrofits. Other professionals have insisted in the necessity to be proactive by discussing the methodological changes required to ensure the emergence of green value. Bouteloup *et al.* (2010)[31] published a professional paper entitled "*Assessing and guaranteeing the green value in real estate*"[32]. They reckon that although academic studies have proven the existence of an additional value for sustainability in real estate, this value is not yet accounted for by valuers and new methodologies are required to assess potential impacts on existing portfolios and guide future investments. Along these lines, Chazel (2010) suggests another definition of green value which is not solely based on market observation but on a systemic analysis of factors that could impact the financial performance of assets.

Specialised media have contributed to disseminate key results from all those studies. They brought a messianic connotation to the concept, illustrated with expressions such as "*The rise of the green value*"[33] , "*Green value matters more and more*"[34], "*Green value is here!*"[35],*etc.* Identifying green value thus appears as a quest for a Holy Grail which will save the real estate sector from its economic crisis. In less than ten years, the expression "green value" has thus shifted from a rhetorical figure used by academics to promote their results, to a mantra invoked by professionals in their quest to protect their long term portfolio's value and create value opportunities with stakeholders.

[29]Cerqual (2012) *Economic analysis of the Green Value of residential real estate*. March 2012 (translated from a 2011 study)

[30]Ademe (2011) Analyse préliminaire de la valeur verte pour les logements. Septembre 2011. Online:http://www2.ademe.fr/servlet/getBin?name=0B0F67D089FFD89763453D21F373745B_tomcatlocal1336037299292.pdf

[31] Bouteloup, G., Bullier, A., Carassus, J., Ernest, D., Pancrazio, L., Sanchez, T. (2010) Evaluer et garantir la valeur verte immobilière. *Réflexions Immobilières*, n°53, pp.39-46.

[32] Translation of the initial French title "Evaluer et garantir la valeur verte immobilière."

[33] http://www.cler.org/L-emergence-de-la-valeur-verte

[34]http://www.actu-environnement.com/ae/news/immobilier-valeur-verte-compte-de-plus-en-plus-20144.php4

[35] http://www.planbatimentdurable.fr/immobilier-la-valeur-verte-est-la-a758.html

# Appendix 2: Motivations mentioned by the sample

### *Types of motives quoted by the sample*

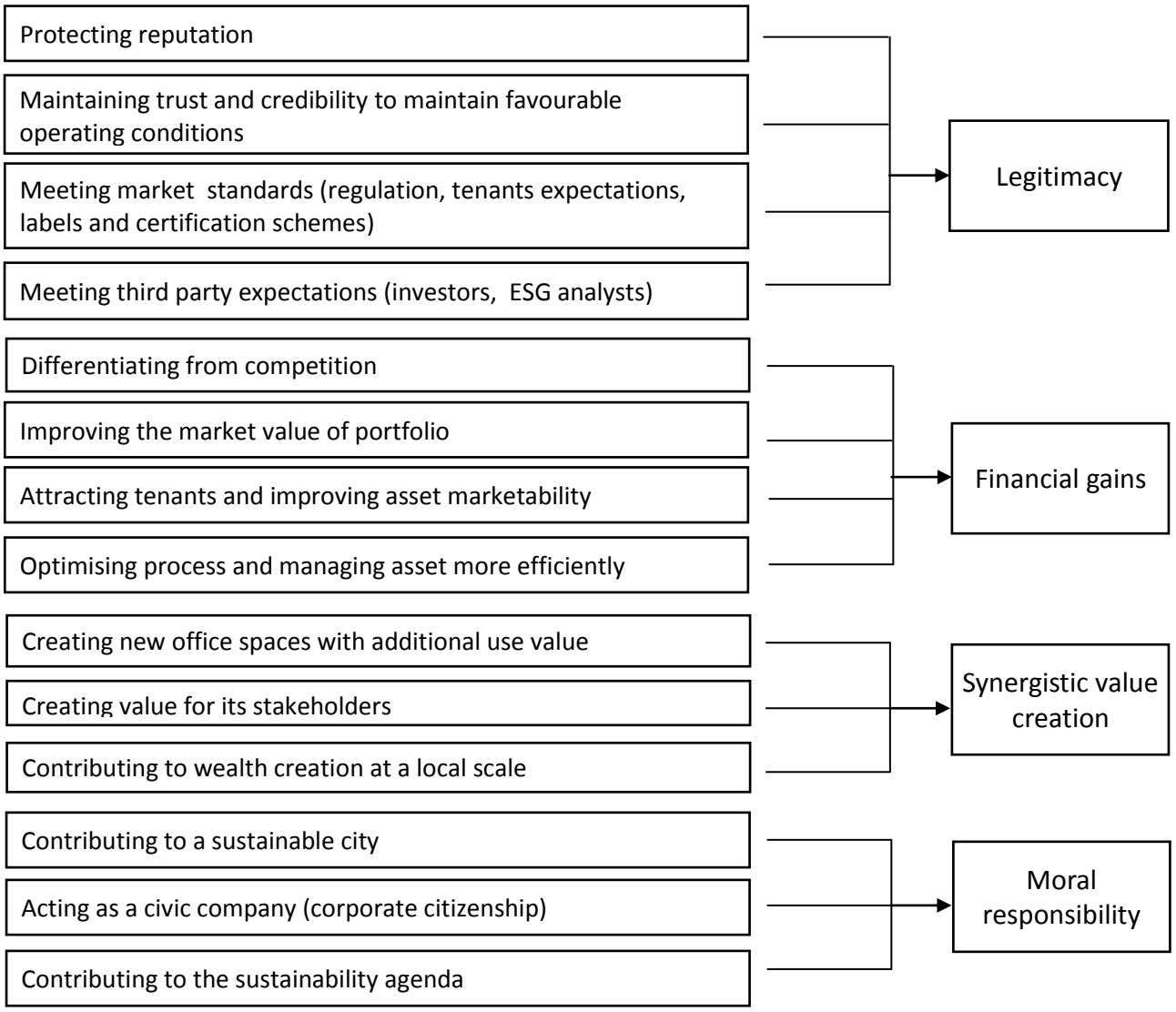


**Figure 15: Types of motives mentioned by the sample**

***Evolution of the motives quoted by the sample over time***

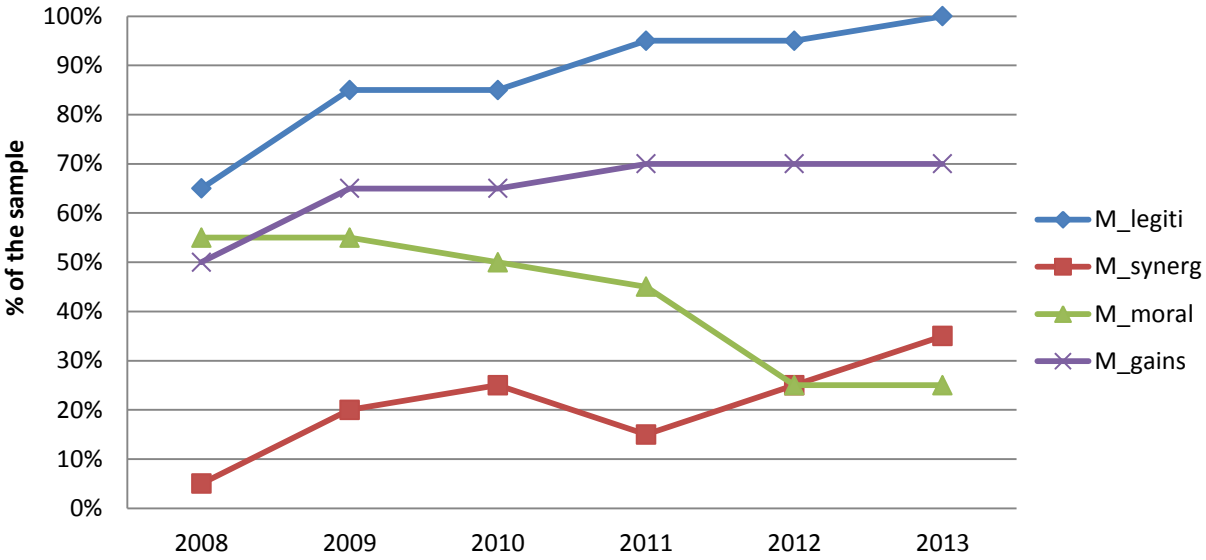


**Figure 16: Share of the sample quoting each motivation**

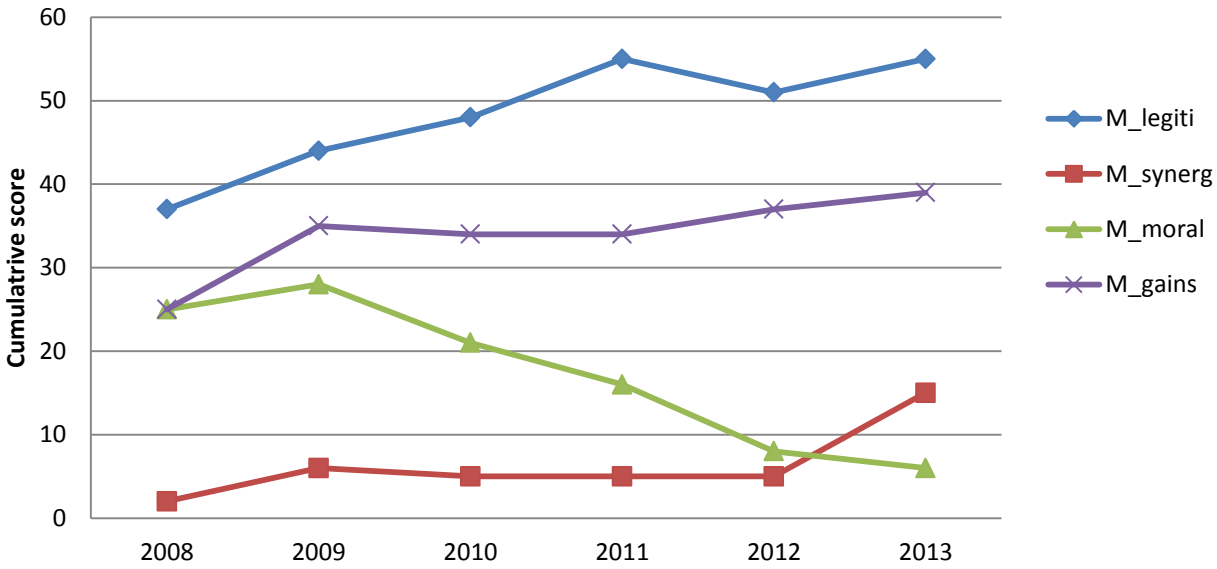


**Figure 17: Overall importance of the various CSR motivations**

NB: Each motivation is scored from 0 to 3 according to its relative importance in the report, and aggregated at the sample scale

# Appendix 3: CSR policies and organisations mentioned by the sample

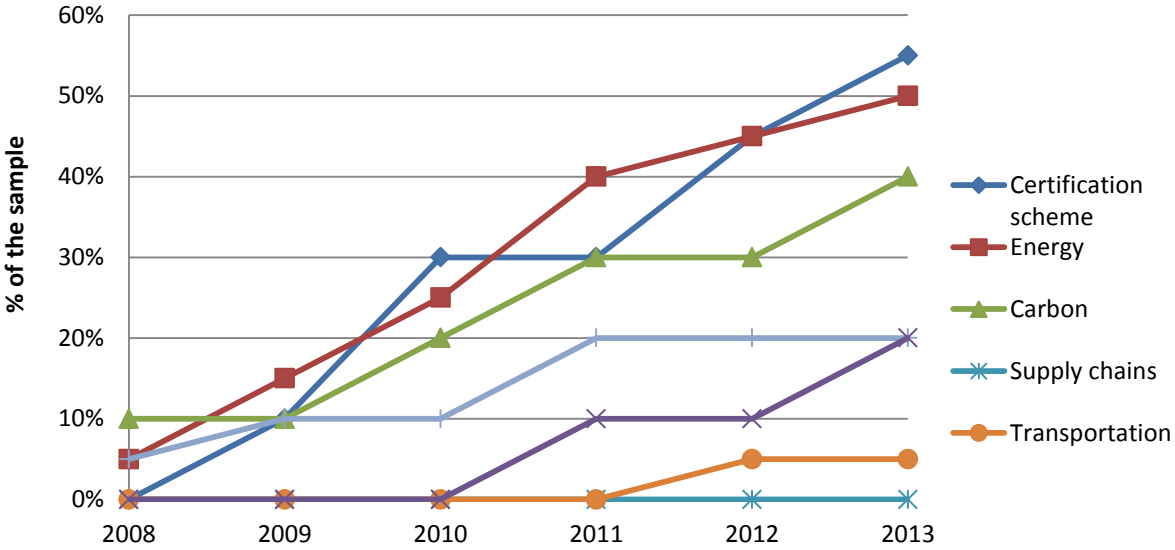


**Figure 18 : Share of the sample disclosing performance targets**

NB: It may be noted that the performance targets to which companies commit differ. However, general pattern can be observed. For example, energy performance targets seem to be either aligned with a 38% reduction target by 2020 (incidentally, it is the target mentioned in the Grenelle 1 Act) or with a 25% reduction target by 2020 (incidentally, it is the target mentioned in the Working group piloted by Maurice Gauchot in preparation of the enacting decree[36]).

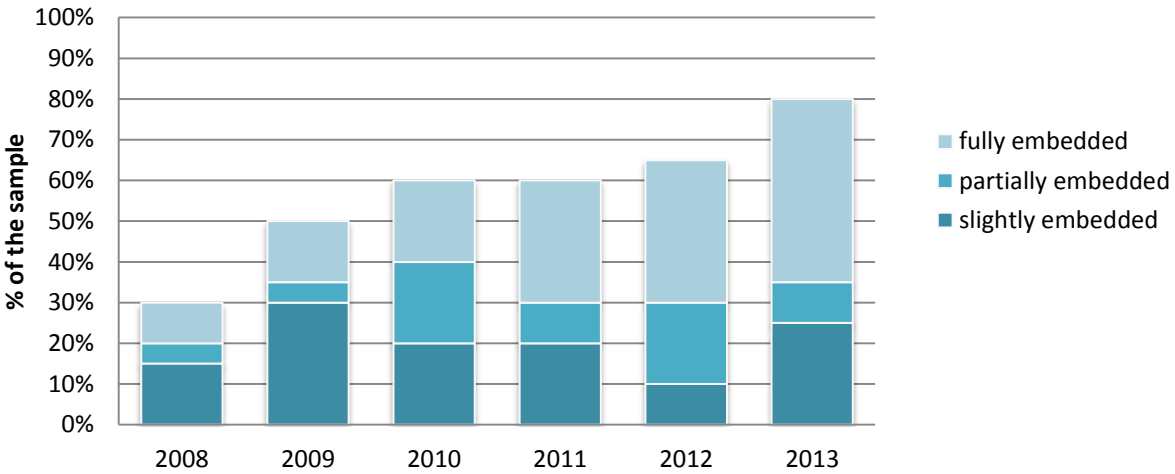


**Figure 19: Level of integration of CSR considerations within organisations**

[36] http://www.planbatimentdurable.fr/IMG/pdf/rapport_obligation_renov_parc_tertiaire_nov_2011.pdf

# Appendix 4: Change processes

The sequence of prevailing motivations is analysed from 2008 to 2013 for each company. The orders in which motives unfold are examined to test to what extent they match with the process described in **Figure 13**. Results are presented in **Table 10**.

| **Consistent with the process proposed** | **90%** |
|---|---|
| Moral -> Legitimacy -> Financial gains | 10% |
| Moral -> Legitimacy | 20% |
| Legitimacy -> Financial gains | 25% |
| Financial gains -> Synergistic value creation | 5% |
| Financial | 5% |
| Legitimacy | 25% |
| **Not consistent with the process proposed** | **10%** |
| Legitimacy -> Moral ->Financial gains | 5% |
| Moral -> Financial Gains -> Legitimacy | 5% |

**Table 10: Breakdown of the sample according to the sequence of prevailing motives over time**

# PART 2

# Labels and certifications associated with sustainable real estate

This section focuses on labels and certification schemes associated with sustainable real estate. This focus is justified by the fact that market players often used these schemes to flag sustainability performance to occupiers. Understanding how these schemes have evolved and are perceived by occupiers is thus paramount to better understand the value of sustainability-real estate in the space market.

**Chapter 3** investigates the diffusion of the HQE certification scheme among the large office spaces market. Since its creation in 2005, this voluntary sustainability credential has swiftly spread among the new and refurbished large office buildings in the Greater Paris Region to become a market standard. Using the literature on the diffusion of innovations and a unique transaction database, I analyse successively supply side factors (related to investors and developers) and occupiers side factors (related to companies occupying the premises) to understand the underlying mechanisms explaining this swift market penetration.

**Chapter 4** questions the existence of a demand for sustainable real estate beyond the mere brand value of labels. It rests on a survey among French corporate real estate managers. Different types of occupants' profiles are highlighted according to their perception of certification schemes and to their trust in the environmental performance of certified premises. This chapter suggests that most companies are mainly driven by image and reputation issues when selecting certified office spaces. Consequently, the sustainable brand image of the scheme is paramount. However, some companies are also expecting more concrete benefits from certified premises (in terms of economic gains, improved comfort and more flexible workplace). Along these lines, the environmental performance of certified premises may also become an issue.

# CHAPTER 3: Diffusion of certifications in the French commercial real estate market

## 1. Introduction

Since the 90s, various rating tools have been developed worldwide to assess the sustainability performance of buildings (see for instance Reed *et al.,* 2011 for further details). For some of these tools, the assessment process is certified by third parties and lead to a label. Examples include BREEAM in the UK, LEED in the US and Canada, DGNB in Germany, CASBEE in Japan, etc. These schemes have swiftly spread to become standards for sustainable buildings (Cole, 2005).

The French certification scheme, HQE (Haute Qualité Environnementale), was officially launched in 2005[37]. Since then, the number of certified buildings has increased rapidly among French new developments. Seven years later, it had become a market standard for new offices buildings in the Greater Paris region. In 2012, three fourths of the supply of new office spaces were certified. Several elements may explain this evolution.

On the one hand, developers may have anticipated the requirements of certification schemes within their environmental management systems. The Barometer of Environmental reporting in the Property sector'[38], published by Novethic, lists several developers committing to certify their whole office production as early as 2010. In this regard, certification scheme could be analysed as an innovation in the development stage of buildings.

On the other hand, investors and users may be motivated by the development of Corporate Social Responsibility (CSR) and responsible investment (RI). Certified buildings represent a means for institutional investors to implement their responsible investment policy and for corporate real estate managers to implement their corporate social responsibility. Several academic and professional studies have also highlighted financial benefits for sustainable buildings. World GBC (2013) published a broad synthesis of key findings. For occupants, sustainable buildings may entail lower occupation costs, better image, improved productivity through improved comfort, etc. For investors, they may generate higher rents, lower maintenance costs and lower depreciation risks.

[37] The HQE approach existed before this date. It was developed by the Association de la Haute Qualité Environnementale (HQE) which was created in 1996 to purse experimentations on high environmental quality buildings. However, for nine years, it remained a general approach, which could not be certified. The certification scheme was launched in 2005. The first officially labelled buildings were certified shortly after. For a more detailed history on the HQE certification scheme, see Cauchard, L. (2011) *Les collèges d'experts et la fabrique de la normalisation technique*. Doctorat, Université Paris Est.

[38] The Barometer is an annual publication analysing the communication of the real estate sector since 2007. It focuses on the existence of commitments on environmental topics and the disclosure of metrics to monitor the advancement of the action plans. ( See http:/www.novethic.com)

This article aims to analyse the diffusion of the HQE certification scheme in the French market from 2005 to 2013, using the literature on the diffusion of innovation. Both demand side factors and supply side factors are successively examined. **Figure 20** synthesises the research process.

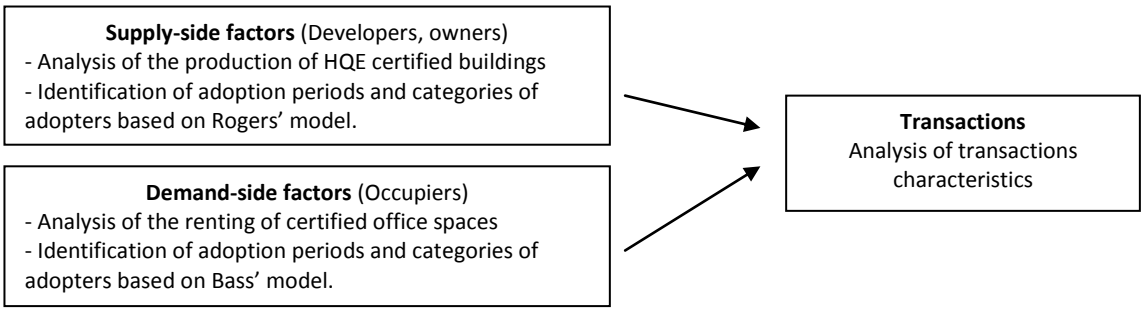


**Figure 20: Illustration of the research process**

First, **section 2** summarises contextual elements on the HQE certification. Then, **section 3** presents the literature review and the resulting hypotheses, whereas **section 4** describes the data used to test this framework. The diffusion among the suppliers (e.g. developers and owners) is explored through aggregated statistical data on the production of HQE certified buildings (new developments or deep retrofits). Rogers (1983)' model is used to identify the various periods of adoption. Results on this approach are presented in **section 5**. The diffusion among the occupiers is investigated thanks to a rental transactions database. Categories of adopters are determined using Bass' model for the diffusion of innovations. Findings are presented in **section 6**. There are put into perspectives by an investigation of the characteristics of the transactions presented in **section 7**. Last section concludes.

# 2. Presentation of the HQE certification

## 2.1. Presentation of the HQE certification

Certifications schemes are voluntary schemes accredited by third parties which ensure that minimal requirements are being met and grant the right to use the label (Horne, 2009). In France, two types of schemes must be distinguished: energy labels and environmental certification schemes. Energy labels are voluntary initiatives dedicated to energy performance. They anticipate future regulatory requirements and aim to provide the market with intermediary steps between two energy regulations. The HPE (High Energy Performance) and BBC (Low Consumption Building) labels were developed for buildings consuming respectively at least less than 10% and 50% of the energy level required in the energy building code RT2005. The Effinergie BEPOS (Zero Energy Building) label aims a further reduction of approximately ten percent compared to the RT2012 regulatory standard and the production of renewable energy within the building site to offset the residual energy consumption.

As opposed to energy labels, environmental certification schemes correspond to multi-criteria frameworks. In France, the main certification for sustainable buildings is the HQE system ("Haute

Qualité Environnementale"[39]). The HQE certification is an assessment system initially developed for new buildings and deep retrofits. It comprises fourteen environmental topics: energy consumption, waste management, water management, indoor conditions, etc. For each topic, the certification framework specifies different requirements such as the presence of bicycle sheds, the level of energy consumption, etc. According to the number and ambition of the requirements met, each topic is rated on a three-level scale: "Very Performing," "Performing" or "Basic". To obtain the HQE label, at least three topics need to be rated "Very Performing" and four "Performing". HQE certification may thus be obtained with the highest scores for all the sustainability themes or with only minimal requirements.

Since its creation, the framework has evolved to maintain its lead compared to the market standard. In particular, up to 2009, the minimum energy target corresponded to the HPE label. It was set later to the BBC standard. In addition, new certifications schemes have been developed to extend the framework to other types of buildings. In 2010, a specific framework was developed for in-use stage, the HQE Exploitation label. This certification scheme analyses the environmental management of building operation, and assess the improvement strategy implemented by the different actors: owners, occupants and technical services companies.

This article focuses on the HQE certification for new buildings and deep retrofits. Energy labels are not considered since they are mainly used to anticipate new regulatory standards by developers and focus primarily on energy efficiency. In-use certifications are not examined since they were still too emerging to allow a statistical analysis. In addition, these schemes are not a characteristic of the premises before the transaction, and thus cannot be analysed in the same way as certification for construction and renovation stages. They can indeed be obtained separately by the landlord or the tenant while the building is already occupied, and focus rather on the presence of an environmental management system than on performance levels.

## 2.2. Diffusion of the HQE certification

The first HQE certified office building dates back to 2005. Since then, this voluntary credential has swiftly spread among the new and refurbished large office buildings in the Greater Paris Region. **Figure 21** describes the evolution of certified office buildings among the first-hand transactions (lighter curve) and among the supply of new office buildings (darker curve) in the Greater Paris Region.

[39] Literally "High Environmental Quality"

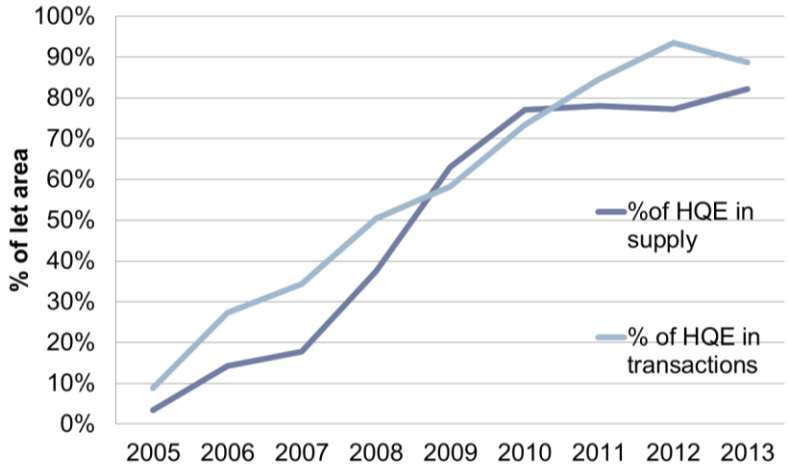


**Figure 21: Evolution of the share of HQE labelled premises in the Greater Paris Region (premises over 5,000 sqm)** (source: compiled by the author from data provided by DTZ Research and Certivea)

Whereas certified offices spaces have steadily increased among first-hand transactions, their share in the supply have jumped more brutally between 2007 and 2010. This tends to suggest different diffusion patterns in the adoption of certification by suppliers of office spaces and by occupiers of office premises. This article aims to investigate those two diffusion patterns to understand how the HQE certification scheme has spread from an initial niche market to become mainstream in the large office market in the Greater Paris Region.

# 3. Conceptual background and research hypotheses

To investigate how certification schemes have spread among new and refurbished office spaces, an analogy can be made with the literature on the diffusion of innovations. This analogy between labelling schemes and innovations is not new. Thøgersen *et al.* (2010) used for example a similar approach to analyse consumers' responses to eco-labels. It can be justified by the fact that labels aim to differentiate existing products through the addition of new characteristics, in particular the label brand. This section aims to presents this conceptual background, and the hypotheses derived from it as regards the diffusion of the HQE certification.

## 3.1. Diffusion of innovations

### *Diffusion patterns*

The diffusion of an innovation corresponds to the process through which "*the innovation, defined as an idea, practice, or object perceived as new by an individual or other relevant unit of adoption* [is] *communicated through certain channels over time among the members of a social system*" (Rogers, 1976, p.292). If this concept has been traditionally used to analyse how new products were adopted by consumers, it can also be applied to the diffusion of new managerial processes and new technologies among suppliers (Stoneman and Ireland, 1983; Mahajan *et al.,* 1988; etc.).

The diffusion of an innovation is usually analysed by considering its various stages of penetration in a market. The cumulative numbers of adopters (proportion of potential users who have already adopted the product as a function of time) is usually captured by a S-shaped curve where a period of slow growth is followed by a faster increase (Rogers, 1976; Mahajan *et al.,* 1990; Tellis, 2007).

The first stage corresponds to the product introduction. It is followed by the take-off which coincides with the first dramatic increase. Take-off has been traditionally explained by a restructuring of the supply resulting in a decrease in prices (Bass, 1980; Agarwal and Bayus, 2002; Tellis, 2007). This period may be followed by a slowdown corresponding to a temporary decrease in the rate of adoption of the innovation. Golder and Tellis (2004) suggest several explanations to this slowdown. First, it may result from a dual market phenomenon due to the fact that the product offered in the first stage of diffusion differs from the one offered at maturity. Second, it could coincide with the time necessary for information to spread among potential adopters (informational cascades) and for the product to become more affordable.

During the later stage of diffusion, Agarwal and Bayus (2002) argue that demand side factors may also play a role. They reckon that the structuration of the supply side will be accompanied by an improvement in the perception of the innovation by customers, resulting in a shift in the demand in favour of the new product. In other words, if supply side factors are crucial to explain the take-off, demand side factors may more strongly influence the later stage of diffusion.

### *Timing of adoption and categories of adopters*

Adopters may be classified into different categories according to the period when they first adopt the innovation. One of the most well-known segmentation is Rogers' categories of adopters. Rogers (1983) distinguishes between innovators, early adopters, early majority, late majority and laggards. He derives these categories from the timing of their adoption, using the mean and standard deviation of a normal distribution associated with the non-cumulative curve of adoption. In Rogers' segmentation, the share of each category of adopters is thus predefined, as presented in **Table 11**.

| **Adopters categories** | Innovators | Early adopters | Early Majority | Late Majority | Laggards |
|---|---|---|---|---|---|
| **% cumulative adopters (Rogers 1983)** | 2,5% | 16% | 50% | 84% | 100% |

**Table 11: Rogers' adopters categories for the diffusion of innovation**

This method is very simple, and can be easily applied when few data are available. However, it is only a rough appraisal which do not account for specificities in diffusion patterns. Other more complex methods have been proposed to better account for diffusion mechanisms, in particular as regards the importance of imitation in adoption behaviours.

In particular, Mahajan *et al.* (1990) suggest using diffusion models such as the Bass model to compute adopters' categories. Bass (1969) distinguishes two categories of adopters: "innovators" who refer to individuals who "*decide to adopt an innovation independently of the decisions of other individuals in a social system*"; and "imitators" who refer to individuals who "*are influenced in the timing of adoption by the decisions of other members of the social system*" (Bass, 1969, p.216). Whereas the probability of adoption by innovators does not depend on pressure from the social system, the probability of adoption by imitators increases with the number of previous buyers. The probability of adoption at a given time, P(t), thus results from the probability of adoption when there is no other buyer and the probability of adoption due to the proportion of previous adopters, F:

$$P(t) = p + q\,F(t) \quad (1)$$

Where p is the coefficient of innovation and q the coefficient of imitation.

According to Bass model, the cumulative portion of adopters F(t) thus verifies:

$$\frac{dF(t)}{dt} = [\,p + q\,F(t)\,][\,1 - F(t)\,] \quad (2)$$

The cumulative portion of adopters is thus deduced by solving this differential equation. Hence:

$$F(t) = \frac{1-e^{-(p+q)t}}{1+q/pe^{-(p+q)t}} \quad (3)$$

Mahajan *et al.* (1990) suggest using the inflexion points of F(t) and its derivatives to deduce the different adoption categories and the associated time periods. Their results are summarised in **Table 12**.

| **Adopters categories** | Innovators | Early adopters | Early Majority | Late Majority | Laggards |
|---|---|---|---|---|---|
| **% cumulative adopters** | | $F(T_1)$ | $F(T^*)$ | $F(T_2)$ | |
| **Time at the end of the period** | | $T_1 = -\frac{1}{(p+q)}\ln\left[(2+\sqrt{3})\frac{p}{q}\right]$ | $T^* = -\frac{1}{(p+q)}\ln(p/q)$, | $T_2 = -\frac{1}{p+q}\ln\left[\frac{1}{(2+\sqrt{3})}\frac{p}{q}\right]$ | |

**Table 12: Mahajan *et al.* (1990)' adopters categories for the diffusion of innovation**

They suggest a resolution using the discrete model. If $S_t$ is the yearly sale at time t (no repeated sales), $Y_t$ the number of previous buyers (cumulative sales before t) and m the size of potential buyers, equation (2) becomes:

$$S_t = pm + (q - p)Y_{t-1} - q/m\,Y^2_{t-1} \quad (4)$$

p, q and m can thus be calculated by regressing $S_t$ on $Y_{t-1}$ and $Y^2_{t-1}$. If $S_t = a + bY_{t-1} + cY^2_{t-1}$ :

$$\begin{cases} p = a/m \\ q = b + a/m \\ m = \frac{-b-\sqrt{b^2-4ac}}{2c} \end{cases}$$

## 3.2. Application to the diffusion of HQE certification scheme

Certification schemes for new buildings and retrofits correspond to management systems for the integration of sustainability topics into the design and construction of buildings. They require developers to account for different new criteria in their project management. Once obtained, the certification schemes may be used to market the offices spaces among potential occupiers. As such, I postulate that previous results from the diffusion of an innovation may apply to the diffusion of certification schemes:

*H1: The diffusion of certification schemes of buildings may be analysed as the diffusion of an innovation, following a S-shaped curve.*

If this hypothesis is verified, the methodologies previously described to assess the timing of adoption and identify various categories of adopters may thus be applied to study the diffusion of the HQE certification among developers/owners and occupiers.

## 3.3. Application to the supply of HQE certified buildings

By analogy with previous results, I also postulate that the take-off of the diffusion is primarily explained by supply side factors, in particular by the structuration of the supply of certified buildings.

> *H2: The take-off of certifications schemes may be explained by its integration into developers' management practices.*

## 3.4. Application to the demand for HQE certified premises

### *Demand side factors in the diffusion of certification schemes*

Similarly with the analysis of supply-side factors, I postulate that the adoption of certified premises by office building occupiers follows a pattern similar to the diffusion of innovations. I thus examine to what extent demand-side factors also explain the later stages of the diffusion of HQE certification schemes.

> *H3a: The demand from office spaces occupiers has accelerated the diffusion of certification schemes after the initial take-off resulting from the structuring of the supply.*

### *Occupation of certified office spaces according to the type of organizations*

To investigate the different categories of occupants of certified office spaces according to their timing of adoption, I refer more broadly to literature investigating why companies engage in corporate social responsibility (CSR). Bansal and Roth (2000) empirically identifies three main motives for companies to go "green": moral responsibility, legitimacy, and competitiveness. These three motives may still apply to investigate companies' motivations to occupy certified office spaces (Eichholtz *et al.*, 2011).

First, companies may be driven by their moral responsibility independently of the associated costs and benefits. Kahn (2007) suggests for example that individuals with environmental values are more likely to make greener choices in their daily choices. Similarly, companies with strong environmental values (NGOs, public sector, companies specialised in environmental products or services) may be more prone to occupy sustainable office spaces.

Second, companies may feel pressured into engaging in corporate social responsibility for legitimacy issues. Occupying a certified office buildings may help companies project a "greener image", improve an already controversial reputation (companies with core activities exposed to controversies), or appear consistent with an existing "green reputation" (Wæraas and Ihlen, 2009; Baron *et al.,* 2011).

Third, companies may choose to occupy certified office space to improve their competitiveness. The theoretical business case of sustainable buildings highlights several benefits which could help firms occupying sustainable office buildings to gain a competitive edge. Theoretically, sustainable buildings can help achieve energy and water savings (Kats *et al.,* 2003), but also productivity gains through improved indoor comfort and health and through employees' satisfaction (Heerwagen, 2000; Kato *et al.*, 2009).

This theoretical framework has been empirically investigated by several authors. Most of them agree that companies having strong CSR policies are more prone to occupy certified office space (Miller and Buys, 2008; Dixon *et al.*, 2009; Van de Wetering and Wyatt, 2011; Nappi-Choulet and Decamps, 2013; Levy and Peterson, 2013). However, results vary as regards the impact of the activity sector and the size of companies. Using a survey on actual moves in the UK, Dixon *et al.* (2009) highlight that companies in the telecommunication industries are less likely to occupy certified office spaces. Examining LEED and Energy Star labelled spaces in the United States, Eichholtz *et al.* (2011) suggest that firms with high level of human capital willing to attract the best trained workers (financial sector), firms operating in environmentally sensitive sectors aiming to improve their reputation (construction and mining sector), and organisations willing to demonstrate best practices (public sector and NGOs) are more prone to occupy certified office spaces. Focusing on Bristol regions (UK), Van de Wetering and Wyatt (2011) conclude that companies within the public sector, large private firms with strong CSR policies, and smaller private companies with core activities in sustainable technologies or services, more frequently locate in sustainable buildings. Their results are aligned with those from Levy and Peterson (2013), based in-depth interviews with Australian companies. In France, Nappi-Choulet and Decamps (2013) study the importance of sustainability-related features for the attractiveness of districts. They use a survey to analyse willingness-to-pay for locations in sustainable business districts. They suggest that listed companies from the industrial sectors are more likely to consider district sustainability, in particular when they own the premises.

Hence the following hypotheses:

> *H3b: Large companies have adopted certified office spaces earlier than smaller companies.*
>
> *H3c: Companies in the financial sector, in the public sector and in heavy industry have adopted office spaces earlier.*

## 3.5. Spatial trends in the diffusion of certification schemes

Several articles suggest that the demand for certification schemes is stronger for buildings located outside well-established business districts (Dixon *et al*., 2009; van de Wetering and Wyatt, 2011; Levy and Peterson, 2013). Sustainability-related features may be used to offset the various disadvantages of moving outside traditional district zones. First, it may compensate the loss of the reputation associated with prestigious neighbourhoods by creating an "iconic building" which will represent the company's brand (Levy and Peterson, 2013). Second, companies may aim to gain more flexibility in their use of space. Third, companies may improve comfort to compensate their employees for the relocation costs (burden of the relocation as well as increased transportation time) and maintain a

good level of employees' satisfaction. Indeed, Landier *et al.* (2009) suggest that relocations often result in deteriorated social relations within a company.

Hence the following hypothesis:

*H4: Certifications schemes must have first spread outside traditional business districts.*

# 4. Data

The real estate data used in this paper were mainly provided by DTZ Research, the research department from a real estate broker. The data on the HQE certification schemes come from the certification body, Certivea, in charge of the HQE certification. The list of certified buildings disclosed by Certivea was matched with the transactions data from DTZ Research to ensure the validity of the information for each transaction.

## 4.1. Data for the analysis of supply-side factors

To analyse the supply of new office buildings (or deep retrofits), I considered yearly consolidated data on the production of new buildings and retrofits between 2005 and 2013 according to the various Immostat zones[40]. Since the data available only corresponded to aggregated information, I used Rogers' method to determine the various categories of adopters among suppliers and investors. As a complementary analysis, I also investigated the reports of the ten largest French developers on their policy and commitments as regards certification.

To build his categories, Rogers utilises the cumulative curve of adoption. His segmentation has traditionally been used to describe consumers' adoption of an innovation, by investigating the number of initial purchases (no repeated sale). This approach has also been applied to the adoption of new process or procedure by suppliers (Mahajan, Sharma and Bettis, 1988). Applying this framework to the diffusion of certification schemes among developers would ideally require knowing when each supplier has developed his first certified building. I did not obtain this information. However, I did have access to aggregated data on the share of HQE certified buildings in the supply of large office spaces, and used an examination of developers' documentation to confirm and interpret key findings.

## 4.2. Data for the analysis of demand-side factors

To analyse the profile of occupiers, I used a transaction database provided by DTZ Research. I supplemented it with further information on the profile of occupants (lessee) and suppliers (lessor) as well as with information on the presence of a HQE certification scheme. Since the level of precision of the data was sufficient, I used the more detailed methodology proposed by Mahajan *et al*. (1990) to investigate the categories of adopters among occupiers and associated periods of adoption.

[40] Immostat proposes a geographical classification of locations in the Greater Paris Region, according to sub markets. This classification is commonly used by brokers.

This database comprises virtually all transactions on office spaces over 5,000 sqm in the Greater Paris Region between 2005 and 2013. The timeframe was selected to coincide with the date of the first transactions on certified office spaces. More than 630 transactions were thus recorded. Each transaction is described by:

- The transaction date,
- The presence and characteristics of a HQE label for the premises,
- The characteristics of the premises (total area, quality, location, age),
- The characteristics of the contract (pre-letting, lease duration),
- Information on the future occupants (activity sector, turnovers, listed or not),
- Information on the investors/developers renting the office space.

Main descriptive statistics are displayed in **Appendix 1**. Results are provided for all transactions (630 transactions) and for first-hand transactions only (373 transactions). First-hand transactions are transactions on new and deeply refurbished buildings and correspond to 59% of the full sample.

Transactions on certified buildings represent 28% of all transactions. They consist mainly of new buildings (79%) and restructured office spaces (19%). On average, transactions on certified buildings concern larger premises (19,217 sqm against 11,202 sqm) and are more frequent for headquarters and front offices (54% against 41% for non-certified premises). In addition, they are mainly located outside the central business districts. In particular, the suburban zones (CROISSANT OUEST, PREMIERE COURONNE, DEUXIEME COURONNE) host two thirds of the transactions on certified premises.

As HQE certified buildings correspond mainly (97%) to first-hand transactions, I focus the analysis on this sub-sample. Certified premises amount to 46% of first-hand transactions. They have spread very rapidly among the first hand market, jumping from 3% to 92% in nine years. The main differences previously highlighted on the whole transaction database remain noticeable within this sub-sample. Compared to other new premises, certified offices spaces are larger and more frequently located outside conventional business districts. The peripheral Parisian zones (PARIS SUD, PARIS NORD EST) and the western crescent (CROISSANT OUEST) are the regions with the highest share of transactions on certified office buildings.

# 5. Diffusion of the HQE among suppliers

This section investigates how the suppliers (developers and investors) have gradually chosen to develop certified office buildings rather than non-certified office buildings. It first examines to what extent the adoption process follows the patterns associated with the diffusions of innovations highlighted in the literature review, before discussing a segmentation of adopters based on the time of adoption.

## 5.1. Periods of diffusion in the supply of HQE premises

The share of HQE premises in supply is considered to examine the cumulative curve of adoption of the HQE label by suppliers. This curve is fitted with a logistic function F(t) = $\frac{K}{1+Kb_0e^{tlnb_1}}$, using a least

square minimization procedure. Results are presented in **Figure 22**Erreur ! Source du renvoi introuvable**.** The fit between the data and a S-shaped logistic curve is good ($R^2$ = 0,921). This supports hypothesis H1.

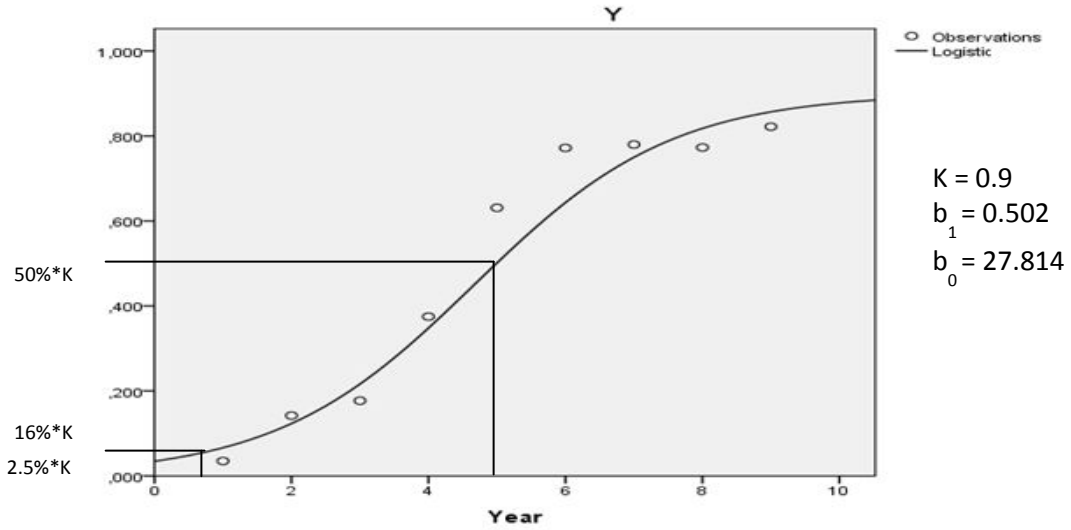


**Figure 22: Fit of a S-shaped curve on the evolution of the supply of HQE premises**

As discussed previously, Rogers' categories are thus used to investigate the various categories of adopters of HQE certification among the developers (see **Table 11**). The dates (t*) associated with each category of Rogers' segmentation ($Y_{rogers}$ ) are calculated by solving $F(t^*)/K= Y_{rogers}$ . Results are presented in **Table 13.**

| **Adopters' categories** (Rogers, 1983) | **Innovators** | **Early adopters** | **Early majority** | **Late majority** | **Laggards** |
|---|---|---|---|---|---|
| **% of cumulative adopters** | 3% | 16% | 50% | 84% | 100% |
| **Period** | | PERIODR2 | PERIODR3 | PERIODR4 | PERIODR5 |
| **End of the period** | January 05 | May 07 | January 10 | June 13 | |

**Table 13 : Repartition of suppliers according to Rogers' categories**

Results distinguish between five categories of suppliers according to the period during which they develop their first HQE office buildings. Innovators are not clearly distinguishable in the model. This could be explained by the fact that the innovators would probably be composed of the investors who participate in the pilot operations before the official launch of the label. The early adopters consist in suppliers having adopted the HQE certification before the second quarter of 2007. The late diffusion unfolds starting early 2010. By mid-2013, the HQE certification had been adopted by more than 84% of the suppliers of large office spaces in the Greater Paris Region.

The use of the Rogers' categories has several limits. In particular, I used the share of HQE certified premises in office spaces supply and not directly the cumulative number of suppliers adopting the HQE certification. Utilising this variable as a proxy for the cumulative rate of adoption implies that each supplier develops the same surface area of certified office space. This probably leads to underestimate the number of adopters and overweight the importance of large market players. As very large office spaces were certified first, this could mean that the actual diffusion process takes more time than what the model suggests for small market players and less time for large market

players. Further research should be conducted among small size market players to investigate further impact of companies' size.

## 5.2. Profile of suppliers among each diffusion period

The profile of suppliers for each of the periods previously identified (see **Table 14**) is thus examined. During the second period (from January 2005 to May 2007), French developers offer the highest share of HQE premises, and are strongly represented among early adopters. In the third and fourth periods, all types of suppliers are catching up the trend. Real estate managers appear to lag behind. This group is more heavily composed of smaller market players and foreigners, which may explain the delay. During the fifth period, nearly all companies had developed certified office spaces. Only real estate companies developing small buildings in the Central Business District are left behind.

| | | PERIODR2 | PERIODR3 | PERIODR4 | PERIODR5 |
|---|---|---|---|---|---|
| SUPPLIER_TYPE | OTHER | 9% | 37% | 81% | 100% |
| | REAL ESTATE COMPANY | 7% | 25% | 74% | 80% |
| | REAL ESTATE MANAGER | 5% | 40% | 68% | 100% |
| | DEVELOPER | 27% | 36% | 79% | 100% |
| SUPPLIER_FOREIGN | YES | 3% | 35% | 77% | 100% |
| | NON | 18% | 35% | 74% | 95% |
| SUPPLIER_SIZE | Less than €100M | 15% | 32% | 61% | 100% |
| | Between €100M and €500M | 6% | 35% | 72% | 100% |
| | Between €500M and €1bn | 6% | 43% | 78% | 88% |
| | More than €1bn | 26% | 26% | 80% | 100% |

**Table 14 : Share of suppliers developing HQE certified premises according to organisations' profiles for each period of diffusion**

To check the significance of these statistical differences, independence tests are conducted. Since the observations are not normally distributed for our variables, non-parametric Fisher exact tests are used rather than Chi-square tests. Results are displayed in **Appendix 2.** For the variables *Supplier_type* and *Supplier_foreign,* the independence hypothesis is rejected when analysing the whole period and when analysing the second period of the diffusion specifically, but not when analysing the latter periods of diffusion. For the variables *Supplier_size,* independence hypothesis is only rejected for the second period. This confirms the significance of the discrepancies in the profile of adopters for the early stage of adoption but for the latter stage.

To summarise, large French developers have been leaders in the supply of HQE premises in the early diffusion of the HQE certification schemes. From 2007, they have been progressively caught up by other types of suppliers, with a mainstreaming to more than half of the suppliers starting in 2010. Diffusion among real estate managers and real estate companies was slower, in part due to the diversity of profiles in this category. In particular, small players, foreign funds, as well as real estate companies specialised in the central business district developed their first certified premises later.

## 5.3. Suppliers' commitments to certify their new developments

To examine further how suppliers have adopted the HQE certification system, I analyse the communication from ten of the largest French developers from 2005 to 2013. In particular, I seek information as regards internal resources dedicated to the certification schemes and commitments to certify all projects under developments. Results are presented in **Figure 23**.

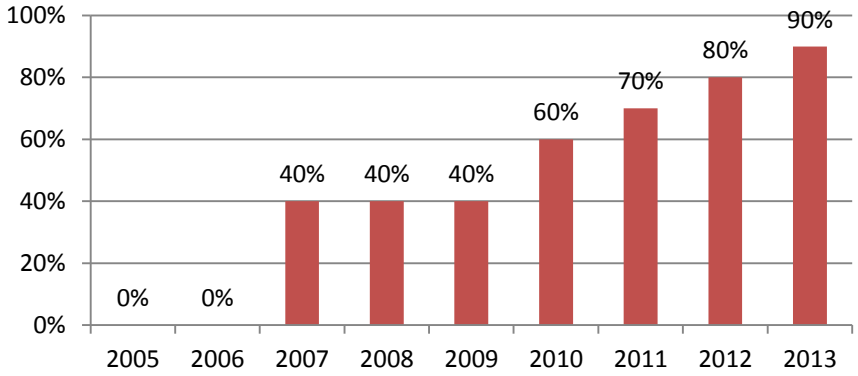


**Figure 23: Existence of commitments on the certification of office building production among the 10 largest French real estate developers**

The share of projects with environmental credentials is one of the first key performance indicators published by those companies, with metrics disclosed as early as 2006 for the leading companies. In the first years, the mere mention of certification schemes appears as a way to demonstrate companies' leadership, with HQE projects presented as exemplary buildings at the cutting edge of innovation.

As early as 2007, developers start to organise different formations and tools for their employees. Their communication suggests their willingness to integrate HQE requirements within their internal process, so as to not rely entirely on external advisors and consultants. They mention awareness-raising initiatives, conference sessions for the staff, and the elaboration of guidance documents, technical tools and sustainability proceedings to streamline environmental management process and ensure the easy certification of projects. Simultaneously, certification schemes start being presented as compulsory requirements to meet market expectations rather than exemplary operations.

The earliest generalisation of certification schemes for all new projects dates back to 2007 with four companies simultaneously committing to certify their whole new production. This figure remains stable during the next two years, and in 2010, two other companies among the ten analysed declare that they generalised certification schemes to all their projects under development. These systematisations can be linked to the fact that since 2009, the certification process was made easier for players with environmental management system ("SMG") acknowledged by Certivea, the certification body. Although each office building remains labelled individually, a developer which has successfully completed at least three certified operations may ask for a review of its environmental management system, which alleviates the certification process for the following operations.

To summarise, 2007 appears as a turning year in the structuring of developers to supply certified buildings. Companies start committing to deliver only certified office spaces and organise their process to ensure the integration of certification schemes requirements into their internal process. It may not be a coincidence that 2007 is also associated with the first Grenelle, a large debate among

government, local authorities, companies, trade unions, etc. which aimed to define French orientations and actions plans as regards sustainable development. This debate was well advertised and strongly contributed to raise awareness on sustainability-related topics.

The analysis of context (in particular the rise of sustainability-related preoccupations associated with Grenelle, and the SMG review by Certivea) suggests that similar changes must have occurred for other market players, even if the movement may have unfolded more slowly. The resulting shift in the sustainability management practices ensured the fast rise in the volume of certified office buildings and the decrease in the production costs associated to certified buildings. This analysis supports hypothesis H2.

# 6. Diffusion of the HQE among occupiers

This section examines the adoption of the HQE label among occupiers using transaction data. Since the data obtained are more detailed, the method developed by Mahajan *et al.* (1990) is used to investigate the different categories of adopters, as described in the literature review section.

## 6.1. Analysis of the diffusion process

To be consistent with the hypothesis of no repeated sale, only transactions involving occupiers who move into HQE certified premises for the first time are considered. These transactions represent 84% of the total transactions on HQE certified premises. The coefficients of the Bass model are thus calculated to describe the diffusion of the adoption of HQE certified premises by office occupiers. Several model specifications are tested to check the robustness of the findings. See **Appendix 3** for the intermediate results.

The coefficient of innovation (p=0.01) is quite low compared to the coefficient of imitation (q=0.35). This suggests that the diffusion of HQE certification schemes among occupiers is rather driven by imitation processes or external factors affected all market players than by leading innovators. The key results associated with the adopters' categories are synthesised in **Table 15**.

| Adopters 'categories | Innovators | Early adopters | Early majority | Late majority | Laggards |
|---|---|---|---|---|---|
| **% of cumulative adopters** | 1% | 21% | 48% | 78% | 100% |
| **Period** | PERIOD1 | PERIOD2 | PERIOD3 | PERIOD4 | PERIOD5 |
| **End of the period** | October 05 | May 10 | January 14 | July 17 | |

**Table 15 : Repartition of occupiers according to Mahajan *et al.* (1990) process**

The time frame of the diffusion is longer than the one observed for suppliers. The early adopters are composed by occupiers having selected their first HQE certified premises before mid-2010. The diffusion of the HQE certification schemes reaches the majority of potential occupiers in the start of 2014. This is consistent with hypotheses H2 and H3a.The take-off HQE certification schemes is driven by suppliers, with mainstreaming among occupiers playing only a later role.

## 6.2. Analysis of the profile of adopters

For each period identified in the diffusion process, the profile of adopters is investigated. Period 1 and period 2 are examined jointly since period 1 is very short. To control for the differences in occupation of large office spaces according to the different companies' profiles, the shares of occupiers selecting HQE premises by companies' profiles are examined rather than raw figures. Descriptive statistics are provided in **Table 16**.

| | | FULL PERIOD | PERIOD1+2 | PERIOD3 |
|---|---|---|---|---|
| ACTIVITY SECTOR | Industries | 49% | 19% | 94% |
| | Services | 42% | 27% | 69% |
| | Public sector | 49% | 19% | 88% |
| | ITs | 59% | 46% | 100% |
| TURNOVER | Less than €500M | 37% | 24% | 67% |
| | Betweeen €500M and €1000M | 38% | 19% | 77% |
| | Between €1bn and €5bn | 56% | 33% | 85% |
| | More than €5bn | 53% | 31% | 85% |
| | Public | 48% | 20% | 88% |
| LISTED | Listed | 47% | 24% | 87% |
| | Not listed | 46% | 29% | 75% |
| | Public | 48% | 20% | 88% |

**Table 16: Share of occupiers selecting HQE labelled premises according to the companies' profile for each of the period of diffusion**

Results suggest that large companies have selected certified office spaces sooner. Differences according to the activity sectors are also found. In the early diffusion, companies in the services and IT industries seem more prone to lead the way in the adoption of HQE certified premises. Conversely, companies in the industry and public sector rather appear as laggards. In the later diffusion periods, large companies in the industry sector and public institutions catch up in the adoption of HQE certified premises. Listed companies become also globally more prone to occupy HQE certified premises.

The significance of these discrepancies is confirmed by the independence tests. Since the observations are not normally distributed, non-parametric Fisher exact tests rather than Chi square tests are used to test the independence between the occupation of HQE labelled premises and the occupiers' profiles. Results are presented in **Appendix 3.** The independence tests confirm the importance of companies' size for the whole diffusion patterns, with large companies more frequently selecting certified premises. However, the differences are significant on each of the sub periods only if the public sector is not considered. The independence test also confirms gaps between activity sectors.

On the whole, hypothesis H3b is confirmed, with larger companies having adopted HQE certified premised earlier. However, the fact that the company's shares are listed only becomes a differentiating factor in the later stage of diffusion. This may be explained by the fact that listed companies are more closely examined than non-listed companies, and may thus feel more pressured into occupying certified premises once certification schemes become more well-known.

By contrast, hypothesis H3c is only partially confirmed. ITs companies are consistently selecting more frequently HQE premises earlier. This may be explained by image and reputation issues, since these companies usually select their premises outside traditional business districts. However, public sector and industries are under-represented in the early stage of diffusion although they more than catch up in the later stage of diffusion. This suggests that imitation and external pressure were important drivers for these players. It is probable that public organisations lacked information and awareness in the beginning of the diffusion. However, when the diffusion reached a certain thresholds they felt compelled to be more proactive to meet expectations as regards their exemplarity. Similarly, industries in our sample consist mostly in large listed companies, which are more under third parties scrutiny. They may thus have felt more compelled to occupy certified premises, in particular as regards their CSR policies.

# 7. Analysis of the transactions

To deepen the analysis, structural changes in the characteristics of the transactions involving HQE certified premises are also examined. For each period, the relations between the presence of a certification schemes and the other variables characterising the transaction are investigated. In order to control for the premises age, only first-hand market is considered. Since the observations are not normally distributed, non-parametric tests are used (Fisher exact test for qualitative variables and Welch test for mean comparison of quantitative variables). Detailed results are displayed in **Appendix 4**.

## 7.1. Characteristics of premises

As regards the characteristics of the premises (see **Table 17**), the presence of a certification scheme depends on the location and size of the premise.

| | FULL PERIOD | Take-off among suppliers | | | Take-off among occupiers | |
|---|---|---|---|---|---|---|
| | | PERIODR2 | PERIODR3 | PERIODR4 | PERIOD2 | PERIOD3 |
| **PREMISES TYPE** | 0.3426 | 0.4552 | 0.3697 | 0.3316 | 0.2886 | 0.2233 |
| **LOCATION** | 0.001169 | 0.5182 | 0.05066 | 0.1431 | 0.005456 | 0.2258 |
| **AREA** | 8.69E-06 | 0.01447 | 0.00814 | 5.36E-05 | 0.0004588 | 0.001603 |

**Table 17: Independence test and means comparison between the characteristics of the premises and the presence of a label.**

The relation between the presence of the HQE certification and the location of the office building evolves over time. Statistical tests confirm that location is significant at the early stage of the diffusion among suppliers (PERIODR3 and PERIOD2). In the first period, there is virtually no transaction on the conventional business district such as La Defense and Paris CBD. Most transactions are located in the first ring outside Paris. However, in the later stage of diffusion, HQE certification spread to all locations. This relation disappears once the HQE certification scheme has

widely spread among suppliers and reached an early majority of occupiers (PERIOD3). This confirms hypothesis H4, with certification becoming mainstream independently of the type of locations.

As opposed to what could be expected, the relation between premises type (headquarters, back office or front office) and the presence of HQE certification scheme is not significant. Hypothesis H3c cannot be confirmed. This may be explained by the fact that premises type depends on the location, with back office and front office more represented outside Paris and La Defense, and headquarters more frequent in the traditional business districts (Paris CBD and La Defense).

## 7.2. Characteristics of commercialisation

Descriptive statistics displayed in **Figure 24**Figure 28 suggest a positive impact of the presence of certification on the commercialisation parameters. On average, certified premises are more frequently commercialised before the actual construction of the building. However, the gap with non-certified premises decreases over time until 2010, and seems to either stabilise or rise again afterwards. On average, certified premises are also negotiated with longer lease duration. However, yearly figures suggest discrepancies with negative gaps in 2008, 2009 and 2011.

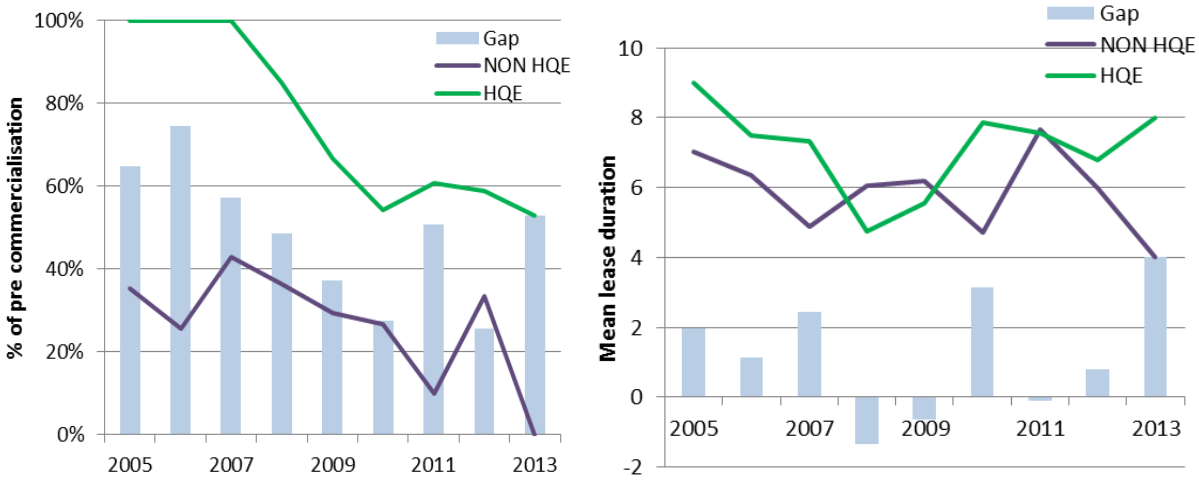


**Figure 24 : Comparison of the evolution of the share of pre-commercialisation and the mean lease duration between certified and non-certified premises**

These relations are tested for significance using independence tests for *Pre_com* variable, and means comparison for *Lease_duration* variable. For both variables, the difference between certified and non-certified premises appears statistically significant for the whole period. However, for the lease duration, the difference is not significant for the intermediate stage of diffusion (period 2). Indubitably, certified premises commercialise better. However, their commercial advantages varied over time, with a decrease during the intermediate stage of diffusion. This may be explained by the fact that the commercial advantages depend on the supply and demand balance for certified premises. In the intermediate stage of diffusion (2007-2010), suppliers adopt certifications by integrating the requirements into their management activities. This leads to a stiff rise of the production of certified premises, whereas the demand from occupiers has not yet fully taken off. Hence the temporary drop in the favourable commercialisation conditions for suppliers.

## 7.3. Impact of the level of ambition of the certification scheme

Certifications can be achieved with various levels of ambitions. As illustrated in **Figure 25**, the share of certified buildings with the highest ambition levels (HQE Exceptionnel, HQE Excellent) has increased over the years, with the exception of a drop in 2009 corresponding to the revision of the HQE certification scheme and the introduction of more stringent criteria.

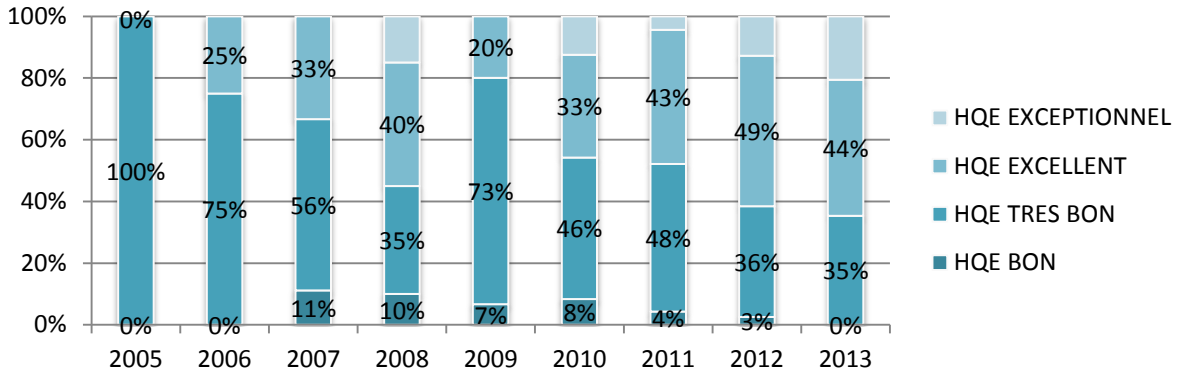


**Figure 25: Environmental ambition of the certified premises over 5,000sqm in the Greater Paris Region**

To investigate the importance impact of this level of ambition, this classification is used to examine the conditions of the commercialisation between 2005 and 2013. In particular for pre-commercialisation, **Figure 26** suggests a differentiating impact not only between certified and non-certified premises, but also between the different levels of certification. However, this differentiating impact exists mostly for the last period of diffusion and not for the intermediary stage (PeriodR2 corresponding to years between 2007 and 2010). This confirms results from section 7.3, and suggests that occupiers have gradually started to differentiate between the different levels of certification.

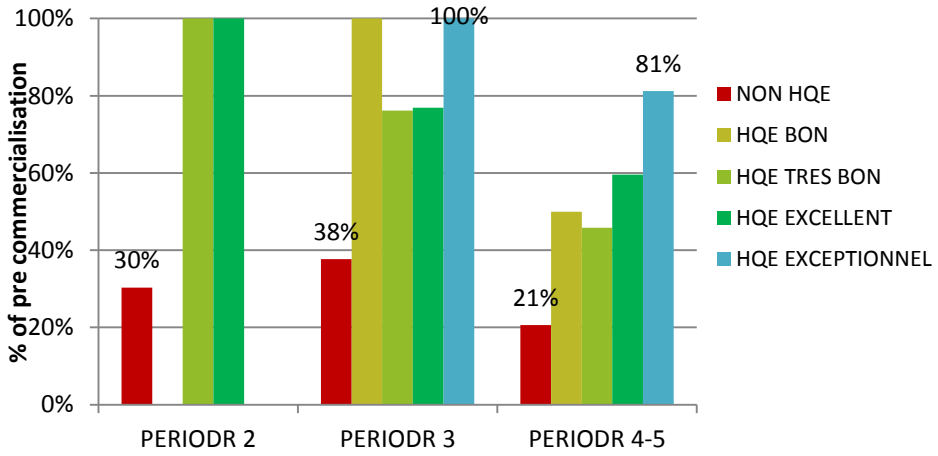


**Figure 26: Impact of the level of ambition of the certification on pre-commercialisation**

To conclude, there seems to be a race towards the highest ambition of the certification. This race could generate an accelerated obsolescence of certified buildings with less ambitious certification profiles. As a consequence, the mere presence of a certification schemes may not prove sufficient to maintain good commercialisation, and thus asset value in the long term. The environmental

performance of the certification could also prove paramount. This topic would require further investigations.

# 8. Conclusion

## 8.1. Summary of key results

The results from the various sections enable to propose a description of how the HQE certification scheme became a market standard over time, distinguishing different diffusion periods associated with different underlying diffusion mechanisms:

- **2005-mid 2007** : This period corresponds to the early diffusion, with the early adoption of HQE certification schemes by suppliers, in particular French large developers. Projects are mainly located outside the traditional business zones of the Greater Paris region. Operations first correspond to pilot projects. As regards occupiers, companies specifically seeking certified premises are scarce. The early adopters among occupiers involve themselves earlier in the transaction process, with virtually all transactions on certified premises corresponding to pre-commercialisation.
- **Mid 2007-2010** : This period corresponds to the take-off in the adoption of HQE certification schemes by suppliers During this period, developers integrate the certification scheme requirements in their organisations so as to standardise the production of HQE certified premises. Projects are still mainly located in the peripheral Paris region and concern on average the largest premises. Diffusion among occupiers is also starting to spread to early adopters consisting of companies in services and IT industries. Commercialisation conditions are less advantageous for suppliers than in the previous period.
- **2011-2013** : This period corresponds to the generalisation of certified transactions to all the first-hand market. It is associated with the late diffusion among suppliers and the take-off in the adoption by occupiers. The public sector and the listed companies in the industry sector catch up the trend and take the lead. Larger premises remain prevalent. Non-certified premises in the first hand market are sanctioned with shorter lease durations, and the level of ambition of the certification starts playing a differentiating role.

Since 2011, certified office buildings have become a market standard for first-hand transactions with developers fully integrating the environmental requirements within their management systems and with large companies specifically seeking certified premises for their large moves decisions.

## 8.2. Potential implications for the long term value of assets

This work has several potential consequences for the commercialisation, and more globally the long term value of office buildings.

First, the swift diffusion of certification among the first-hand transactions implies that any premium due to the presence of a certification could diminish and eventually completely disappear. In the Greater Paris market, certified buildings have become standard, and it is therefore difficult to distinguish the market of certified office buildings from the market of first-hand buildings. The hypothesis that poor environmental performance would command a "brown discount" rather than a "green value" (i.e. a value decrease) seems more plausible. This would require further research.

Second, the mere presence of a certification scheme may not remain a sufficient differentiating factor. The ambition of the environmental profile of the certifications may take precedence. In addition, as users are getting more information and feedbacks on certified buildings, they may become more demanding as regards their proven sustainability performance. Certification schemes may not be enough to ensure tenants' preferences if those schemes are not assorted with evidence on actual performance. Consequently, certified buildings with poor measured sustainable performance and comfort conditions could lose value. Inversely, existing buildings with good performance and comfort quality may be protected for the accelerated obsolescence of non-certified buildings (see **Figure 27**). This aspect will be investigated further in **Chapter 4.**

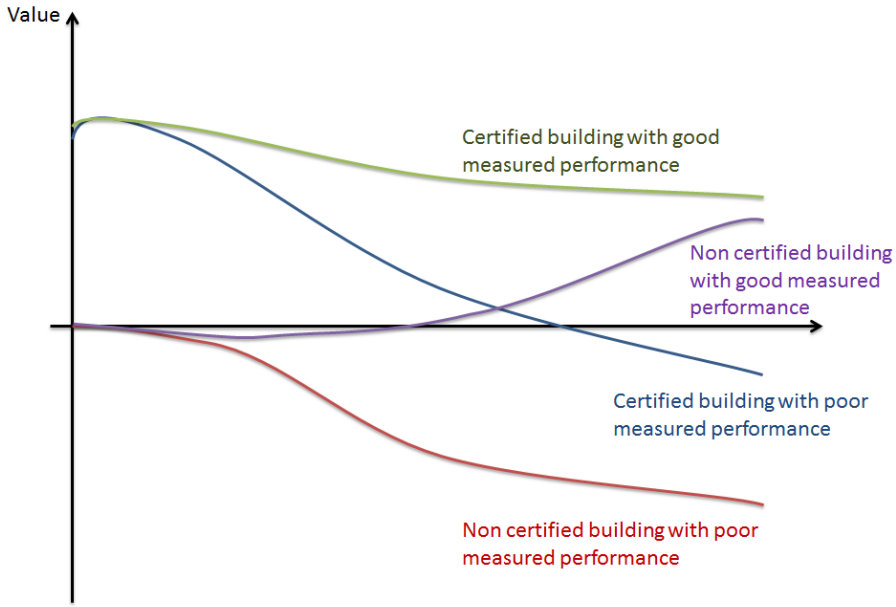


**Figure 27 : Potential impacts on long term assets value**

Last, it is probable that with HQE certification becoming mainstream, government or local authorities could take up the criteria of the certification, and integrate them into a regulatory framework. Current discussions on this topic have already started in the French context, with the working group RBR 2020 in charge of suggesting potential evolutions for the 2020 regulatory framework by the Plan Bâtiment Durable[41]. In particular, their first report[42] recommends the next building code to be extended to a wider scope of environmental issues, as already covered by the HQE certification. In this context, HQE certification scheme will need to evolve to continue to outstrip the regulation.

[41] Body in charge of the implementation of the Grenelle Act in the real estate sector
[42] http://www.planbatimentdurable.fr/reflexion-batiment-responsable-2020-r142.html

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# Appendix 1: Descriptive statistics of the transaction database

| VARIABLES | | All transactions nb:630 | | First-hand transactions only nb: 373 | |
|---|---|---|---|---|---|
| | | HQE | NON HQE | HQE | NON HQE |
| YEAR | 2005 | 2 | 61 | 1 | 34 |
| | 2006 | 8 | 79 | 8 | 47 |
| | 2007 | 9 | 69 | 9 | 35 |
| | 2008 | 20 | 59 | 20 | 33 |
| | 2009 | 16 | 39 | 15 | 17 |
| | 2010 | 24 | 47 | 24 | 15 |
| | 2011 | 23 | 47 | 23 | 10 |
| | 2012 | 40 | 29 | 39 | 6 |
| | 2013 | 36 | 22 | 34 | 3 |
| LOCATION | CROISSANT OUEST | 57 | 93 | 55 | 42 |
| | DEUXIEME COURONNE | 37 | 84 | 36 | 43 |
| | LA DEFENSE | 4 | 64 | 4 | 15 |
| | PARIS CENTRE OUEST HORS QCA | 4 | 5 | 4 | 1 |
| | PARIS NORD EST | 8 | 7 | 7 | 5 |
| | PARIS QCA | 9 | 63 | 8 | 30 |
| | PARIS SUD | 15 | 48 | 15 | 11 |
| | PREMIERE COURONNE | 44 | 88 | 44 | 53 |
| PREMISES SIZE | mean | 19,217 | 11,202 | 19,217 | 12,278 |
| | (std) | (19554) | (8455) | (19555) | (8111) |
| TRANSACTION TYPE | BUILD TO SUIT OPERATION | 25 | 15 | 25 | 13 |
| | RENTAL TRANSACTION | 134 | 382 | 129 | 173 |
| | SALE TO END USER | 19 | 55 | 19 | 14 |
| LEASE TERM (FIRM PERIOD) | mean | 6.88 | 5.54 | 6.88 | 6.05 |
| | (std) | (3.23) | (2.87) | (3.23) | (3.03) |
| PRE COMMERCIALISA | FALSE | 65 | 375 | 60 | 137 |
| | TRUE | 113 | 77 | 113 | 63 |
| BUILDING AGE | OLD | 0 | 100 | 0 | 0 |
| | MODERN | 1 | 86 | 0 | 0 |
| | RENOVATED | 4 | 65 | 0 | 0 |
| | RESTRUCTURED | 33 | 52 | 33 | 52 |
| | NEW | 140 | 148 | 140 | 148 |
| PREMISES TYPE | BACK OFFICE | 64 | 210 | 63 | 89 |
| | FRONT OFFICE | 61 | 140 | 60 | 67 |
| | PUBLIC | 17 | 55 | 17 | 16 |
| | HEADQUARTERS | 36 | 47 | 33 | 28 |
| OCCUPIER EMPLOYEES | E<250 | 16 | 79 | 15 | 26 |
| | 250<E<500 | 20 | 35 | 19 | 13 |
| | 500<E<1000 | 16 | 38 | 15 | 20 |
| | 1000<E<5000 | 41 | 108 | 41 | 51 |
| | E>5000 | 85 | 192 | 83 | 90 |
| OCCUPIER TURNOVERS | PUBLIC | 20 | 65 | 20 | 22 |
| | T<100 M€ | 15 | 76 | 14 | 29 |
| | 100< T<500 M€ | 30 | 85 | 30 | 45 |
| | 500<T<1000 M€ | 17 | 44 | 15 | 24 |
| | 1<T<5 bn€ | 45 | 69 | 43 | 34 |
| | T>5 bn € | 51 | 113 | 51 | 46 |
| OCCUPIER LISTED | FALSE | 50 | 153 | 49 | 66 |
| | PUBLIC | 20 | 66 | 20 | 22 |
| | TRUE | 108 | 233 | 104 | 112 |
| OCCUPIER ACTIVITY SECTOR | OTHER INDUSRIES | 4 | 7 | 4 | 5 |
| | OTHER SERVICES | 6 | 15 | 5 | 4 |
| | COMMUNICATION-CREATION | 8 | 27 | 8 | 12 |
| | FINANCIAL INSTITUTIONS | 35 | 99 | 34 | 41 |
| | HIGH TECH INDUSTRIES | 20 | 43 | 20 | 26 |
| | HEAVY INDUSTRIES | 20 | 40 | 20 | 14 |
| | LAW - CONSULTANCY | 20 | 57 | 19 | 25 |
| | PUBLIC SECTOR | 18 | 55 | 18 | 19 |
| | REAL ESTATE SERVICES | 7 | 28 | 6 | 12 |
| | IT INDUSTRIES | 23 | 28 | 22 | 15 |
| | TRANSPORT-LOGISTICS-DISTRIB | 17 | 53 | 17 | 27 |
| SUPPLIER TYPE | OTHER (user, insurance companie | 25 | 117 | 23 | 36 |
| | REAL ESTATE COMPANY | 39 | 92 | 38 | 45 |
| | REAL ESTATE MANAGER | 51 | 189 | 49 | 73 |
| | DEVELOPER | 63 | 54 | 63 | 46 |

# Appendix 2: Profile of adopters among suppliers

Analysis of the profile of suppliers of HQE premises according to the periods identified using Rogers categories:

PeriodR 2: 01.2005 -> 05.2007

PeriodR 3: 05.2007 -> 01.2010

PeriodR 4: 01.2010 -> 01.2013

PeriodR 5: after 01.2013

| | SUPPLIER_TYPE | SUPPLIER_FOREIGN | SUPPLIER_SIZE |
|---|---|---|---|
| **FULL PERIOD** | 0.0304 | 0.0092 | 0.1455 |
| **PERIODR2** | 0.0809 | 0.0252 | 0.0876 |
| **PERIODR3** | 0.6456 | 1 | 0.4396 |
| **PERIODR4** | 0.7172 | 1 | 0.3517 |
| **PERIODR5** | 0.4348 | 1 | 1 |

**Table 18: Independence tests (p.values) between HQE and profile of suppliers for each period identified using Rogers' categories**

# Appendix 3: Categories of adopters among occupiers

***Regression using Mahajan et al. (1990) method***

Regression results to fit the discrete model : $S_t = pm + (q - p)Y_{t-1} - q/m\ Y^2_{t-1}$

| | *Value* | *p.value* |
|---|---|---|
| Adjusted $R^2$ | 0.895 | |
| Fisher test | 34.984 | 0.0005 |

| | *Coefficients* | *t stat* | *p.value* |
|---|---|---|---|
| Constant | 5.081 | 2.472 | 0.048 |
| $Y_{t-1}$ | 0.342 | 3.432 | 0.014 |
| $Y_{t-1}^2$ | -0.001 | -1.017 | 0.349 |

**Table 19: Regression results**

NB: The global fit is good ($R^2$=0.895). However, the hypothesis that the coefficient is significantly different from 0 is not confirmed by Student test for the last regression coefficient. Since the coefficient is quite low and only a model fit is needed, this is not a strong issue. Moreover, other specifications were also tested, and led to similar figures.

Hence the results: m= 400.80; p=0.013; q=0.355.

The periods of adoptions are the calculated using the equations in **Table 12** of Section 2:

Period 1: 01.2005 -> 10.2005
Period 2: 01.2005 -> 05.2010
Period 3: 05.2010 -> 01.2014
Period 4: 01.2014 -> 07.2017

NB: As robustness tests, similar analyses are conducted with slightly different data and/or models specifications. First, I tested a model including repeated sales. This could be justified by the fact that in real estate, each building is different. The choice to adopt HQE certifications may thus be related to locations and the own characteristics of the buildings and not to a global corporate policy. The results are very similar to those obtained with the no repeated sale condition, with the exception that the diffusion process unfolds approximately a year quicker (early adoption period starting in mid-2009). Second, I test a model using quarterly data instead of yearly data. The model is economically non-significant (diffusion spread over nearly a century). This discrepancy may be explained by the nature of the real estate data which presents a high volatility when considering only quarterly data. The use of quarter periods is thus not adapted and leads to absurd results.

***Profile of occupiers according to adoption periods***

| | **ACTIVITY SECTOR** | **TURNOVER** | **LISTED** |
|---|---|---|---|
| **FULL PERIOD** | 0.2302 | 0.08076 | 0.9753 |
| **PERIOD1+2** | 0.04826 | 0.284 | 0.5802 |
| **PERIOD3** | 0.004422 | 0.1566 | 0.2011 |

**Table 20: Independence tests (p.values) between selection of HQE premises and the profile of occupiers for each period of diffusion**

# Appendix 4: Independence between variables "HQE" and the characteristics of the transaction

- **Analysis of the characteristics of the transactions for the different periods**

| | FULL PERIOD | PERIODR2 | PERIODR3 | PERIODR4 |
|---|---|---|---|---|
| PRE_COM | 1.36E-10 | 3.28E-06 | 8.02E-06 | 0.0002567 |
| PREMISES TYPE | 0.3426 | 0.4552 | 0.3697 | 0.3316 |
| CONTRACT | 0.01083 | 0.008352 | 0.101 | 0.7403 |
| LOCATION | 0.001169 | 0.5182 | 0.05066 | 0.1431 |
| AREA | 8.69E-06 | 0.01447 | 0.00814 | 5.36E-05 |
| LEASE_DURATION | 8.75E-03 | 0.1633 | 0.5083 | 0.01512 |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

**Table 21: Results of the independence tests for the diffusion periods among suppliers**

| | FULL PERIOD | PERIOD2 | PERIOD3 |
|---|---|---|---|
| PRE_COM | 1.36E-10 | 1.06E-09 | 0.0006576 |
| PREMISES TYPE | 0.3426 | 0.2886 | 0.2233 |
| LOCATION | 0.001169 | 0.005456 | 0.2258 |
| CONTRACT | 0.01083 | 0.006056 | 1 |
| BIEN_SURFACE | 8.69E-06 | 0.0004588 | 0.001603 |
| LEASE_DURATION | 0.008745 | 0.4724 | 0.03369 |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

**Table 22: Results of the independence tests for the diffusion periods among occupiers**

- **Impact of the level of ambition of the certification**

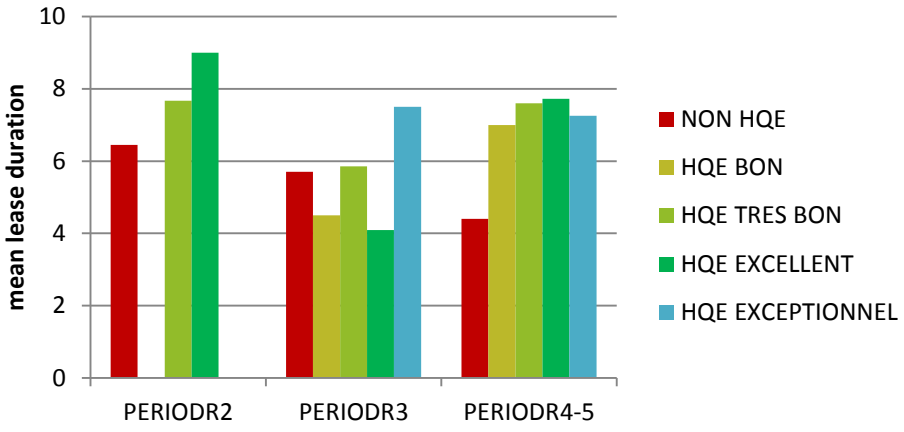


**Figure 28: Mean lease duration according the various level of certification for each period of diffusion**

# CHAPTER 4: Perceptions of certification schemes by occupiers

## 1. Introduction

Over the years, concerns for climate changes have driven policy makers to implement gradually more stringent regulations on the energy performance of buildings. However, sustainability-related issues in real estate do not boil down to energy issues. They also encompass environmental, health and social topics throughout buildings life cycles. Voluntary certification schemes provide frameworks to address a wider range of issues beyond energy performance. Three main sustainability-related certification schemes exist in the French market: the French HQE, the British BREEAM and the American LEED.

In the French market, the HQE certification is the widest spread.[43] This scheme consists in a certification of the environmental management system as well as an assessment on fourteen environmental topics, including energy, water, waste, indoor comfort, management of construction site, etc. For each topic, the certification framework specifies different requirements such as the presence of a bicycle shed, energy consumption level, etc. This certification was initially developed to certify new buildings and retrofits during the construction and respectively renovation stage. More recently, this certification has been adapted to the operation phase with the HQE Exploitation label. This newest version of the HQE label is not considered since it was still emerging when the study was undertaken.

Since the first certifications in 2005, the number of HQE certified office buildings has rapidly increased among French new developments. Nine years later, it has become a market standard for new offices buildings in the Greater Paris Region. In 2014, more than three fourths of the supply of new office spaces were certified. Companies may occupy certified office premises for various reasons. First, companies may seek environmental performance and its resulting economic benefits. Several studies indeed suggest that certified office spaces could result in financial gains for their occupants (Feige *et al*., 2013; WGBC 2013, 2014; etc.). In particular, sustainable buildings may help reduce occupation costs (utilities expenses, maintenance costs, churns costs), and increase productivity gains through improved comfort conditions Second, companies may choose to occupy certified office spaces to convey a “responsible” corporate image. The environmental performance of the building is thus secondary if the brand image of the label is clearly perceived as “environmental-friendly”. Last, companies may be occupying certified office buildings mainly because they were seeking new office spaces, but did not specifically require the presence of a label.

[43] Between 2005 and 2013, all except one French office buildings with a certification credential for the construction stage have the HQE label, even though few of them may also have a double certification with BREEAM or LEED.

Understanding the underlying motives which explain the occupation of certified office spaces is paramount to appraise the value of certification schemes. If occupants are primarily seeking improved comfort and reduced expenses, the added value of certification schemes will come from their being a marker of good environmental performance. The label may thus not have much value if the environmental performances are not met. If occupants are primarily driven by reputation and image, the existence of sustainable benefits becomes less paramount. The mere fact that certification schemes emerge as a widely acknowledged differentiating standard can generate added value through its associated brand image. If few companies actively care about the presence of a label, the certification may not represent a significant added value. Tenants' preferences for sustainable buildings, and certified premises in particular, will ultimately impact financial value for investors themselves, through higher rental value and lower vacancy. Understanding why occupants may choose to occupy certified premises and how their move decisions are impacted by their perception of certification schemes is therefore crucial for investors.

This paper examines the demand for sustainable office spaces. It questions whether there is a demand for sustainability-related features beyond the brand value of certification schemes, by investigating companies' motivations to occupy certified premises and the impact of their perception of the certification on their move decisions. To research this topic, this article draws on the literature on eco-labels. Several authors demonstrate that brand image plays an important role in consumers' purchase decision (Delgado-Ballester and Munuera-Alemàn, 2005; etc.). In addition, they highlight that the brand image has a possible effect on the trust in the environmental performance (Chen, 2010). I want to understand how these two constructs, trust and brand image, impact the motivations to occupy HQE certified premises and the actual move decisions. For the three types of motivations distinguished (image, expenses savings, comfort), I thus consider to what extent green brand image and trust have impacted the selection process and the effective choice of certified premises.

The article is organised as follows. **Section 2** reviews the literature on certified buildings and the evidence of a demand for sustainability-related features in real estate. **Section 3** presents the theoretical framework adopted, using literature on eco-labels. **Section 4** describes the survey among occupiers that is used to test this framework. **Section 5** presents the main descriptive statistics from the survey results. **Section 6** discusses key trends identified thanks to a Principal Component Analysis. Three key motives are identified, and their interactions with the image of the HQE label and the trust in its environmental performance are discussed. **Section 7** examines these interactions further using a mediation model. Last section concludes and suggests practical implications and further research developments.

## 2. The demand for sustainable real estate

Several publications have investigated how corporate real estate managers perceive sustainable office buildings, and to what extent they consider sustainability as a criterion in their move decision.

## 2.1. The business case for the occupation of sustainable premises

Theoretically, the benefits resulting from the occupation of sustainable premises are numerous. Although a wide area of literature (e.g. Heerwagen, 2000) and professional publications (e.g. World GBC, 2013) has discussed them, few provide concrete figures at a statistical level.

First, occupiers of certified buildings could benefit from savings in the building operation (energy, water and waste management) (Kats *et al.,* 2003). However, latest studies show that global occupancy costs for certified premises are not always lower. Using a panel of 134 buildings similar for location, age and general state, Laurenceau (2013) demonstrate that although energy expenses for certified buildings are 8% smaller with 22,2 €/sqr m, the total occupancy costs is higher at 186 €/sqr m, up 4% compared to non-certified buildings. This difference may however be explained by the fact that certified office buildings usually offer more services to their occupants.

Second, occupiers could expect to benefit from the improved indoor conditions. Theoretical literature indicates that benefits resulting from the associated productivity gains of employees would exceed by far the benefits on energy expenses. For example, Fisk (2002) estimates that improving the quality of the heating, ventilation and air conditioning systems could reduce the number of respiratory illnesses by 9 to 20%. These benefits on health and comfort could translate into economic benefits through the productivity gains for employees. Kato *et al.* (2009) also demonstrate an increased productivity for several Australian buildings case studies. Investigating the satisfaction of 1800 employees occupying 18 buildings, Feige *et al.* (2013) find a clear impact on comfort and employees' engagement, but a more limited impact on productivity. Miller *et al*. (2009) survey 534 tenants, and find 4.88% increase in self-reported productivity and 2.88% decrease in sick day for certified buildings. On the whole, statistical evidence is still tenuous but indicates positive relations between the occupation of sustainable premises, improved comfort and health conditions, and productivity gains.

Moreover, occupying sustainable buildings is often presented as a means for a company to improve its image and organisational culture. Levy and Peterson (2013) insist on the importance of branding and marketing in companies' choice of premises. They explain that an iconic building can become the representation associated with the organisation. Occupying a green building may thus implicitly convey the idea that the organisation itself is green. It can also improve the relations between management and the employees, by creating higher satisfaction (Kato *et al*., 2009; Heerwagen, 2000) and by reinforcing the identity and organisational culture (Cole *et al.,* 2008; Brown *et al.,* 2010). Moreover, sustainable premises can have a positive impact to attract and retain staff (Miller and Buys, 2008). Last but not least, occupying sustainable buildings may contribute to a larger CSR policy. In particular, Sayce *et al.* (2009) or Dixon *et al.* (2009) suggest that businesses are demanding more energy efficient and adaptable property as part of their CSR policy. Companies occupying certified premises may thus aim to benefit from a "sustainable image" either by being associated by an iconic sustainable building, or by communicating on their sustainable occupations in their CSR reports.

To what extent have those theoretical gains motivated companies to rent certified office spaces? Each motivation presented previously would lead to significant differences in the expectations of tenants as regards eco-certifications. If financial benefits are paramount, a reliable certification must signal the good environmental performance of the certified premises. If image considerations prevail, it is the reputation of the label which is critical.

## 2.2. Sustainability-related criteria in move decisions

These potential benefits are not always well known by tenants and do not necessarily influence their move decision, nor ensure their increased willingness-to-pay for sustainable premises.

In past literature, move criteria usually rest in an arbitrage between rents and location. For example, Dent and White (1998) show that location is critical, followed by rental costs and flexibility. Several authors have investigated how sustainability-related criteria rank in location choices thanks to surveys. Dixon *et al.* (2009) analyse the actual moves in the UK office markets from 2006 to 2009 through a survey of 50 occupiers. They suggest that although certification schemes are gradually more considered, they remain of little importance compared to location or to the flexibility of the indoor configuration. Van de Wetering and Wyatt (2011), and Levy and Peterson (2013) confirm these results respectively for England and Australia. Thanks to interviews and surveys among occupiers, they highlight that sustainability ranks behind location, accessibility and flexibility. They also suggest that the relative importance of these factors is influenced by the type and size of organisation.

The mere taking into account of sustainability-related criteria in move decisions does not necessarily entails that companies are willing to pay higher rents to occupy sustainable office spaces. In 2014, BNP Paribas Real Estate[44] indicated in the results of a French survey among occupiers, that 74% of the panel believe their next premises would benefit from an eco-certification scheme. However, only 34% of the respondents declare they would accept to pay a higher rent to ensure the certification. Similar results were found in other countries. Addae-Dapaah *et al.* (2009) conduct a survey among 400 commercial real estate users in Singapore on their perception of sustainable office spaces. They suggest that occupants are informed of the benefits of sustainable buildings but are not willing to pay higher rents for them. Using a survey among 145 Swiss corporations, Wiencke (2013) finds that 60% of the companies are willing to pay a premium to rent (3%) or purchase (4.75%) green buildings. In addition, she shows that the premium is higher when companies are purchasing than when they are renting. For the UK, Van de Wetering and Wyatt (2011) find a willingness-to-pay to occupy certified premises that does not exceed 15% of the rental levels.

Surveys among the employees themselves suggest that the discrepancies in the willingness-to-pay may be associated with the poor knowledge on sustainable premises. In Savills' 2014 study, only 27% of the French employees surveyed associate sustainable real estate with certification schemes. Although 40% declare sustainability as important, they do not necessarily connect it with improved increased comfort and productivity (40% of positive response).[45]

[44] User insight 2014. A survey by BNP Paribas Real Estate & Ipsos

[45] http://pdf.euro.savills.co.uk/france/fre-fre/france-commercial---other-fr/spotlight---what-workers-want-fr--septembre-2014.pdf

### 2.3. Users' satisfaction as regards certified buildings

Users' feedbacks on the occupation of certified office spaces are lukewarm. On the one hand, occupiers show greater satisfaction with certified premises. Leaman *et al.* (2007) find that users are globally more satisfied with green buildings. Brown *et al.* (2010) find similar results and suggest that occupants in green buildings are willing to tolerate for discrepancies in comfort on a punctual basis, if they perceive the building as having a better overall quality. Deuble and Dear (2012) also confirm that occupiers are more tolerant of the failings of buildings featuring green characteristics, in particular if when they have high environmental concerns.

On the other hand, there have been some criticisms on the complexity and average environmental performance of certified buildings. Thanks to a survey among employees in two newly built office buildings, Wilkinson *et al.* (2011) highlight a clear gap between users' expectations and users' satisfaction, in particular as regards thermal comfort and air quality. Similarly, Paul and Taylor (2008) find no significant difference in the perception of comfort between certified and non-certified buildings. Using three case studies, Catarina and Illouz (2009) show a gap between the energy consumption target of the label and the actual performance of the first certified operations. Carassus (2011) also highlight that certified buildings may not always met the environmental performance objectives that were promised. As regards technological complexity, Leaman *et al.* (2007) suggest that "green" buildings are at risk of creating unneeded and wasteful complexity. They warn that green buildings that pay little attention to users' needs can create greater dissatisfaction than non-green buildings. Feige *et al.* (2013) survey 1800 employees of office buildings and suggest that building users feel the need to have an influence on their work environment and do not wish to work in buildings which are fully automated.

These failings and resulting dissatisfaction may result from a poor conception of the buildings themselves. Technological learning curve would thus ensure the errors to be corrected over time and the number of mishaps to decrease. Another explanation dwells in the characteristics of the certification systems. The HQE certification scheme heavily relies on the assessment of the management system at the conception/construction stage. A large number of the criteria refers to the mere presence of given technical installations (for example, bicycle sheds), and the performance during the operation stage is not fully assessed. For example, as regards energy performance, the HQE certification estimate a conventional performance based on the conception outlay (Carassus *et al.,* 2013). Several hypotheses are necessary for this calculation, and may diverge from the effective occupation context. Consequently, the performance announced in the certification scheme may deviate from the in-use performance recorded by the occupants.

# 3. Eco labels, brand image and trust in the environmental performance

To investigate further the demand for sustainable premises and the role of certification schemes in move decisions, this chapter draws on the literature on sustainable consumption and eco labels.

## 3.1. Motivations of the demand for sustainable products

Different motives may explain the demand for sustainable products. First, consumers may be driven by their ethical beliefs (Brinkmann and Peattie, 2009). In particular, some consumers which value environment protection may seek to purchase products which meet their environmental concerns. As regards sustainable real estate, companies could seek to occupy sustainable premises as part of their social responsibility.

Consumers may also be motivated by the benefits they expect from sustainable products. For instance, literature on organic food labels highlights that self–interested motives (e.g. health and taste) prevail over altruistic motives (e.g. environmental concerns) (see for example McEachern and Mcclean, 2002). For corporate real estate decision, this could correspond to companies willing to occupy sustainable premises to benefit from the economic gains resulting from expenses savings and improved comfort conditions for their employees. The business case of sustainable premises is thus paramount in their move decisions (see **Section 2**).

Last, sustainable consumption may be driven by conformity and reputation concerns rather than environmental considerations (Carlsson *et al.,* 2010; Thøgersen *et al.,* 2010). Along these lines, the purchase of sustainable products it thus motivated by the sustainable symbol they convey, their brand image. The concept of brand image entails that products may not always been bought for their functional quality but for the symbol they represent or the image they convey (Dobni and Zinkhan, 1990). In this instance, it is all about how the image conveyed by the product will convert into reputation gains for the consumer himself. For corporate real estate, this motive would correspond to real estate companies aiming to occupy a sustainable office building to associate the image of the company image with a sustainable figure.

## 3.2. Eco-labels as a quality signal

When selecting sustainable premises, future occupants do not possess full information on their sustainability performance. There is an asymmetry of information on the quality of buildings. Investigating poor quality cars referred as "*lemons*", Akerlof (1970) demonstrates that asymmetry of information on the quality of products results in a destruction of the chain of trust and adverse selection. Since consumers are not able to distinguish between good quality and poor quality products, they do not accept to pay differentiated prices. The market for good products thus eventually disappears. Transposed into the context of sustainable real estate, this suggests that the absence of information on sustainability-related features could prevent the forming of a demand for sustainable office spaces.

Certifications and labels offer a means to provide information on product quality (see for example Auriol and Schilizzi (2003) for a discussion on the effectiveness of various types of certifications in signalling quality). In particular, eco-labels provide simplified information on the sustainability-related features of products (Galarraga Gallastegui, 2002). They can thus be used by consumers to support their decisions on sustainable purchases.

If eco-labels are necessary to help inform the consumers, they only affect purchase decisions to the extent that the intention to buy a product with environmental features exists (Thøgersen *et al.,*

2010 ; Valor *et al.,* 2013). Conversely, environmental considerations do not necessarily translate into sustainable purchase decisions. An intention–behaviour gap has been highlighted by numerous empirical publications (see for example Carrington *et al.,* 2010). Several explanations to this gap have been investigated. Bray *et al*. (2011) identify in particular the higher prices of sustainable products, consumers' lack of information on sustainability-related features and their associate benefits, inertia in the purchasing behaviours, and more globally a cynicism on the claims of the product and on the impact of sustainable consumption in general.

In addition, eco-labels may not always fully play their role in promoting sustainable consumption. Eco-labels are not always understood by consumers. In particular, they are often perceived by consumers as too complex (Moisander, 2007). In this context, it may not be the analytical examination of the environmental characteristics which prompts the purchase but the overall perception of the labels.

## 3.3. Role of the perception of eco-labels in purchase decisions

Literature on brand equity is particularly relevant for examining how consumers' perception of eco-labels impacts their purchase decisions. From consumers' point of view, Keller (1993) defines brand equity as "*as the differential effect of brand knowledge on consumer response to the marketing of the brand*" (Keller, 1993, p.8). Brand equity thus results from the acknowledgment by consumers that the brand holds a differentiating factor. It entails that consumers place a higher value in the brand, and are willing to pay more to purchase related products (Wood, 2000). A brand with high brand equity should thus be preferred by consumers, and should lead to more purchase intentions (Cobb-Walgren *et al.*, 1995).

The literature traditionally highlights three constructs as the drivers of green brand equity: brand image, consumers' satisfaction associated to past experience, and trust (Chen, 2010). Brand image consists in a set of attributes and meanings that the consumers associate with the brand (Keller, 1993). By extension, this definition can be applied to eco-labels. For products associated with environmental-friendly characteristics, Chen (2010) defines green brand image as "*a set of perceptions of a brand in a consumer's mind that is linked to environmental commitments and environmental concerns*" (Chen, 2010, p.309). Consumers' satisfaction comes from the evaluation of consumers after the act of purchase. For sustainable products, a green brand satisfaction could be defined as the level of post-consumption contentment as regards consumers' initial expectations. Trust conveys consumers' level of confidence that the brand indeed meets what it announces. It resides in the perception of reliability and credibility of the party providing the brand (Delgado-Ballester and Munuera-Alemán, 2005). For eco-labels, trust will depend on the consumers' perception that eco-labels will keep their promises as regards environmental performance.

Chen (2010) demonstrates that green brand image, green satisfaction, and green trust are positively related to green brand equity, with the relation between green brand image and green brand equity being partially mediated by green satisfaction and green trust. In addition, Delgado-Ballester and Munuera-Alemán (2001) suggest that trust is associated to consumers' satisfaction in past experiences.

# 4. Methodology

This section presents the research framework and the data used to test it.

## 4.1. Research framework

Using both the literature review on the demand for sustainable real estate and the literature on eco-labels, I propose the following framework to describe the mechanisms by which companies integrate sustainable certification schemes into their move decisions (**Figure 29**).

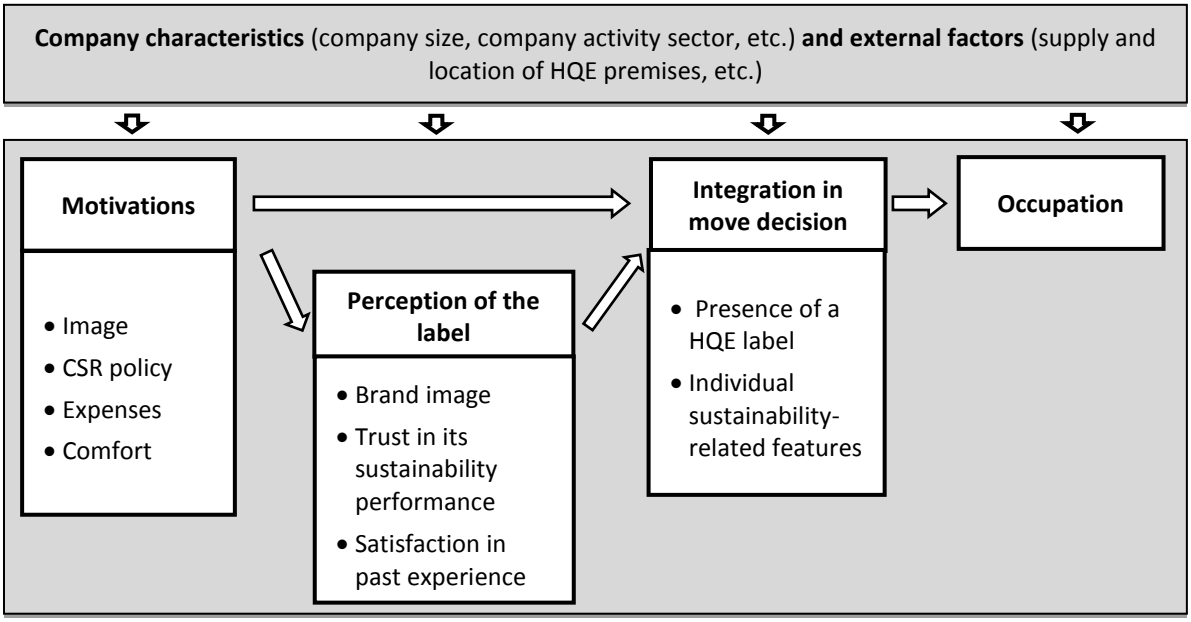


**Figure 29: Research framework**

I postulate that companies will tend to have different expectations and perceptions of the HQE label according to their main motivations when occupying sustainable premises. In particular, companies primarily driven by image and CSR policy will be motivated by the brand value of certification. They will integrate HQE label in their move decision independently of their trust in its being a reliable source of information on sustainability performance. Conversely, companies primarily driven by occupancy benefits (expenses savings, improved indoor comfort and its associated benefits on employees' productivity) will rather be impacted by their trust in the ability of the label to signal sustainability performance, and will tend to rather investigate individual sustainability-related features if they distrust the reliability of the label.

## 4.2. Presentation of the survey

To investigate this research framework, a survey is used. Six preliminary interviews with different companies were first completed to elaborate a survey among corporate real estate managers. The questionnaire was administered in collaboration with DTZ Research, the research department of a

French real estate broker. It was addressed by mail to corporate real estate managers, clients from DTZ, as well as to some corporate social responsibility directors in property department of large companies between July and September 2013. 76 responses were collected among which 60 were fully completed.

The survey focuses on effective moves and actual occupations. Main questions are broken down by different sustainability topics (energy performance, environmental footprint, adaptability of the indoor layout, thermal comfort conditions, etc.). More precisely, the online questionnaire is composed of five sections:

1. **Perception of certifications and sustainability-related features in buildings**: This section aims to measure knowledge on the HQE label, its sustainable brand image, and the level of trust in its reliability as regards sustainability performance. Respondents are also questioned on their motivations and barriers when selecting sustainable office spaces, and certified buildings in particular. They are asked to rate the extent to which each suggested proposition matches their own perception on a Likert scale, ranging from 1 (not important/strongly disagree) to 4 (very important/strongly agree).

2. **Certified office spaces in current occupations**: This section investigates respondents' current occupation of HQE certified office spaces. They are asked whether they occupy at least one certified office space and whether the premises hosting their headquarters are certified. They are also asked about the share of certified office premises they occupy. Last, they must rate on a 4-point Likert scale the extent to which they are satisfied with the performance of their certified office spaces.

3. **Importance of sustainability-related criteria in past moves decisions:** To avoid the intention–behaviour gap highlighted in the literature review, the questionnaire focuses on past moves decisions to question the importance of sustainability-related criteria and the presence of HQE label in decision process. A list of criteria is suggested, including location, rental level, aesthetics, energy performance, presence of an environmental certification, quality of the indoor layout, flexibility of the layout, quality of the workstation. Respondents are asked to rank these various criteria by descending order of importance in their past move decisions. They may also indicate that they did not consider the suggested criteria. They are also asked to rate on a 4-point Likert scale the extent to which the premises they actually moved into match their initial criteria.

4. **Sustainability-related performance in current occupations and willingness-to-pay for sustainable features**: This section investigates the overall sustainability performance of respondents' current occupations. Each item is rated on a 4-point Likert scale. Responses are used as a standard benchmark to ask respondents for their willingness-to-pay to improve the sustainability-related features of the office spaces they occupy.

5. **Respondents' profile**: Respondents are asked to provide information on the activity sector and size of their company, the number of occupation sites and the presence of a dedicated corporate real estate management team.

### 4.3. Methodological bias

The use of a survey raises several limits, in particular due to the topic investigated. Sustainability is a consensual topic. As such, respondents may be tempted to present themselves on their best light by granting more importance to sustainability in their responses than they would have in practice. The focus on effective moves is an attempt to mitigate this effect. In addition, the survey relies mostly on close-ended questions, with participants being asked to rate their approval of suggested items. It is probable that spontaneous responses would have led to different results. Six preliminary interviews with different corporate real estate managers were conducted to verify the type of topics mentioned by participants in open-ended situations. These interviews have helped frame the questionnaire so as to limit the methodological bias.

## 5. Descriptive statistics

This section presents the main statistical results on the sample of respondents who have fully completed the questionnaire. It describes the profile of the respondents, and examines successively motivations, importance of sustainability-related criteria in move decisions, and perception of the environmental performance of certified buildings. Further details are provided in **Appendix 1**.

### 5.1. Description of the sample

The sample is mainly composed of companies in the service sector (63%), with over 1000 employees (82%) and over 50 premises. In addition, 47% of the companies surveyed own a department dedicated to corporate real estate management.

53% of the respondents occupy at least one certified office space. Companies from the industry sector represent 44% of the respondents occupying at least one certified office space. However, they tend to occupy certified premises more frequently (63% occupy at least one certified premises against 47% for respondents in the services sector). Companies with large staff and with dedicated corporate real estate department also rent certified office spaces more frequently.

70% of the respondents had a move decision within the last three years. This sub-sample is composed mostly of large companies. It is evenly distributed between companies with dedicated corporate real estate management department and companies with no dedicated department.

### 5.2. Motivations of companies selecting certified buildings

The main drivers declared by the respondent for the selection of certified office premises are enforcing a corporate social responsibility (CSR) policy (95% of positive answers), improving company’s image (85% of positive answers), and reducing expenses and improving comfort

conditions (80% of positive answers) (see **Figure 30**). Productivity gains are quoted last, although theoretical literature highlights that they may represent the highest gains. This may suggest that corporate real estate managers are not aware of these benefits, or that they are at least sceptical as regards their veracity.

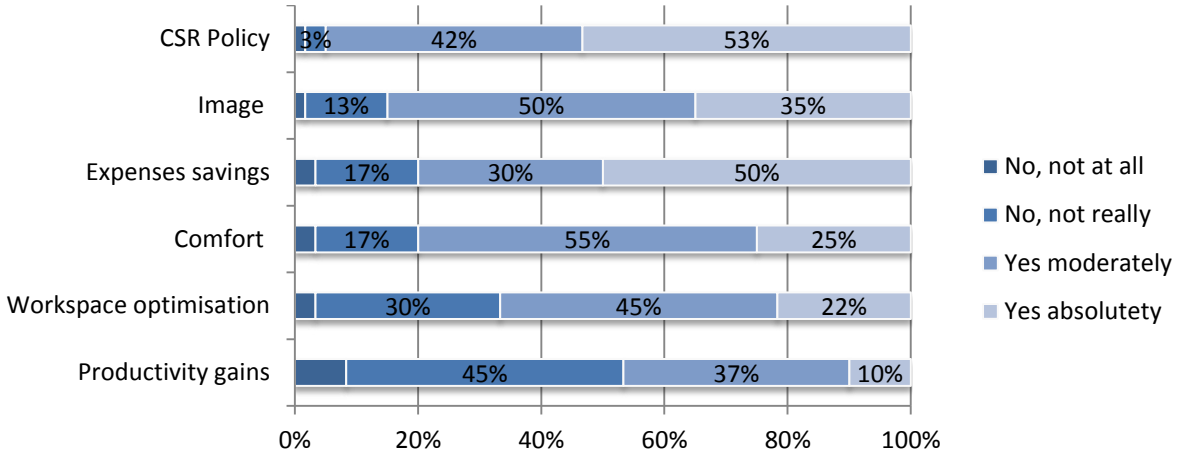


**Figure 30: Respondents' motivations for occupying certified premises**

## 5.3. Importance of environmental criteria in move decision

During their past moves decisions, location, rental level and flexibility of the layout are the main criteria examined by the respondents (see **Figure 31**). On average, energy performance and environmental labels rank behind the traditional decision criteria. On the whole, these results are consistent with past findings in the literature. Location remains critical and environmental topics ranked lower than flexibility (Dixon *et al.,* 2011; van de Wetering *et al.*, 2011; Levy, 2013).

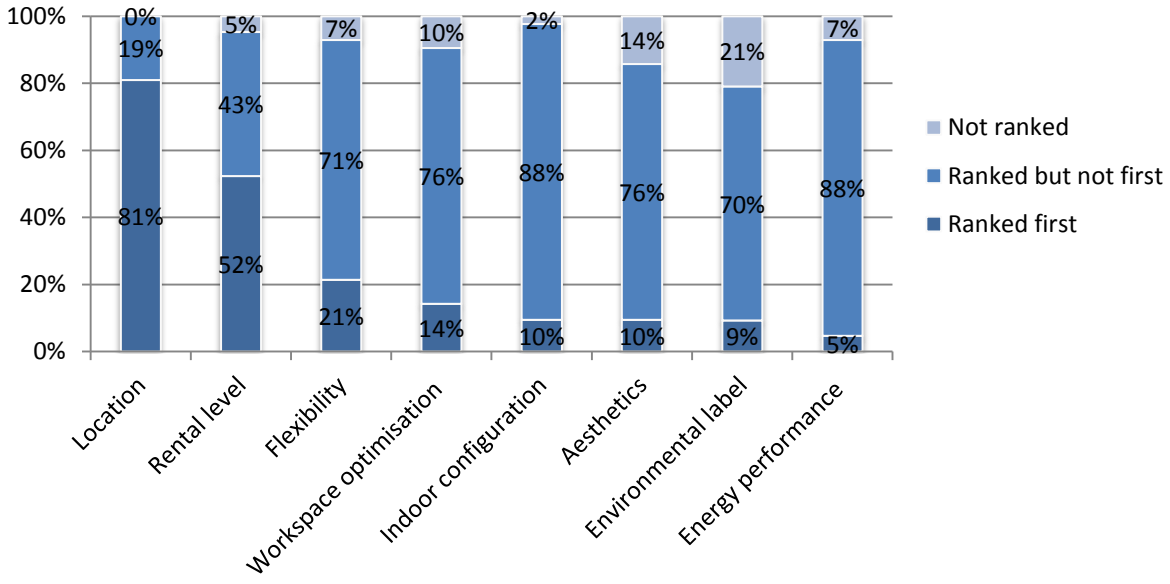


**Figure 31: Respondents' ranking of move decision criteria**

However, situations are very contrasted. 21% of the respondents did not consider the presence of the HQE label at all whereas only 9% were specifically seeking it. It is also interesting that although energy performance ranks on average better than the presence of a label, fewer respondents (5%) declare it as a decisive criterion. This tends to suggest that for a small group of respondents the brand image of the label is decisive, sometimes independently of the effective energy performance.

## 5.4. Importance of environmental performance beyond the presence of a label

Nearly two thirds (65%) of the sample has a positive image of the HQE label as an environmental credential (**Figure 32**). On average, the HQE certification benefits from a more environmental brand image than the BBC and BEPOS labels, two voluntary schemes focused on an improvement of the regulatory energy performance. This suggests that the multi-criteria nature of the HQE certification scheme is acknowledged by most occupiers. However, the survey does not verify that occupiers are well informed on the criteria used in the certification scheme, in particular the existence of different rating levels that may be associated with the certification.

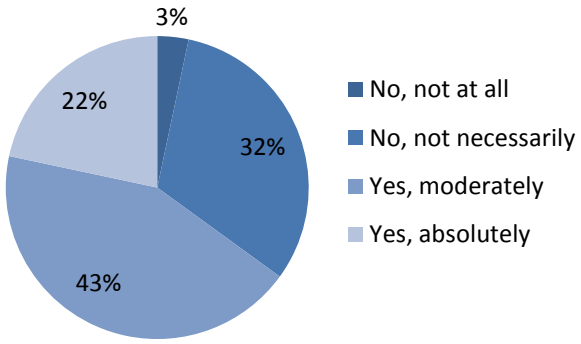


**Figure 32: Respondents' image of HQE label as an environmental certification**

On the other hand, 43% of the sample is sceptical as to the ability of the HQE certification to guarantee a good level of environmental performance (**Figure 33**). This figure is to be compared with the 25% of respondents occupying at least one certified office space who declared to be dissatisfied with the performance of their certified premises.

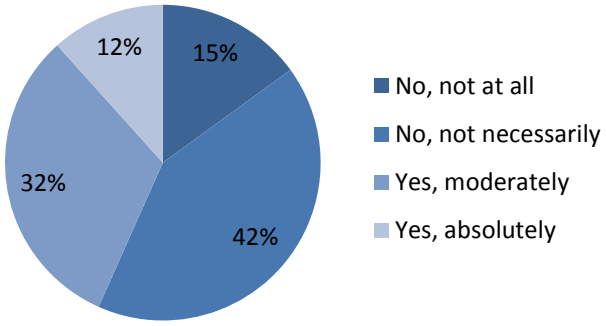


**Figure 33: Respondents' distrust of the environmental performance of the HQE label**

Overall, the results from the survey suggest that even though certification schemes are still mainly sought for image purposes, there are also expectations on improved environmental performance that would be reflected in expenses savings. As corporate real estate managers get feedbacks and

gain higher awareness on the effective in-use performance of certified buildings, the mere presence of a certification scheme may not be sufficient to differentiate certified buildings.

# 6. Trust in the label and motivations to occupy certified premises

To further investigate the interactions between the different motivations to occupy certified premises and the mechanisms at stake, a Principal Component Analysis (PCA) is conducted.

## 6.1. Presentation of the PCA method

The Principal Component Analysis was chosen to disentangle the various responses to the survey and identify key underlying patterns. This exploratory method is often advised in literature to analyse survey results (Hinkin, 1988). It helps synthesise information along several independent dimensions, identified thanks to the calculation of eigenvalues and their associated eigenvectors.

Variables included in the PCA analysis are the different motivations to occupy HQE, the image of the HQE certification, and the trust in the performance of HQE certified premises. All variables are normalised to ensure similar weightings in the computation. FactoMine package in the statistical software R is used to run the analysis. Only the first three dimensions are kept, since their eigenvalues are superior to 1 (Kaiser criterion). Willingness-to-pay for sustainability-related features, current occupation of certified premises and ranking of certification in move criteria are examined as supplementary quantitative variables. Industry sector and size, as well as the position of the real estate function within the organisation are investigated as supplementary qualitative variables.

## 6.2. Drivers for the occupation of certified premises

The first three dimensions resulting from the PCA analysis account for 66% of the total variance of all active variables. To interpret these dimensions, the contribution of each active variable is examined for each of these 3 dimensions (see **Appendix 2**, **Table 28** and **Table 29**).

- The first dimension appears to mainly correspond to the following factors: *Motiv_expenses, ImageHQE, DistrustHQE* and *Motiv_prod*. It can be interpreted as the perception of the environmental performance of the HQE certified premises and the consecutive motivation to occupy HQE premises for economic benefits. Respondents with high coordinates on this dimension globally believe in the better environmental performance of HQE premises, and this belief is an incentive to occupy labelled premises.
- The second dimension appears to be mainly associated with the following factors: *Motiv_Image* and *Motiv_CSR*. It can be interpreted as the importance of CSR image in the motivation to occupy certified office spaces, compared to the perspective of actual economic benefits.

- The third dimension is mainly associated with the *Motiv_comfort* and *Bar_rent* variables. It corresponds to the importance of the rental level compared to employees' satisfaction and work conditions.

The correlation circle provided in **Figure 34** synthesises the relations between the variables (correlation, independence, and direction). Active variables are represented in black whereas quantitative supplementary variables appear in blue. If the vectors associated with two variables share the same orientation and direction, the variables can be considered as positively correlated. If the vectors share the same orientation but opposite directions, the variables can be considered as negatively correlated. If the vectors are perpendicular, the variables can be considered as not correlated. Those relations are verified by the calculation of the correlation coefficients tested for significance (see **Table 30** in **Appendix 2**).

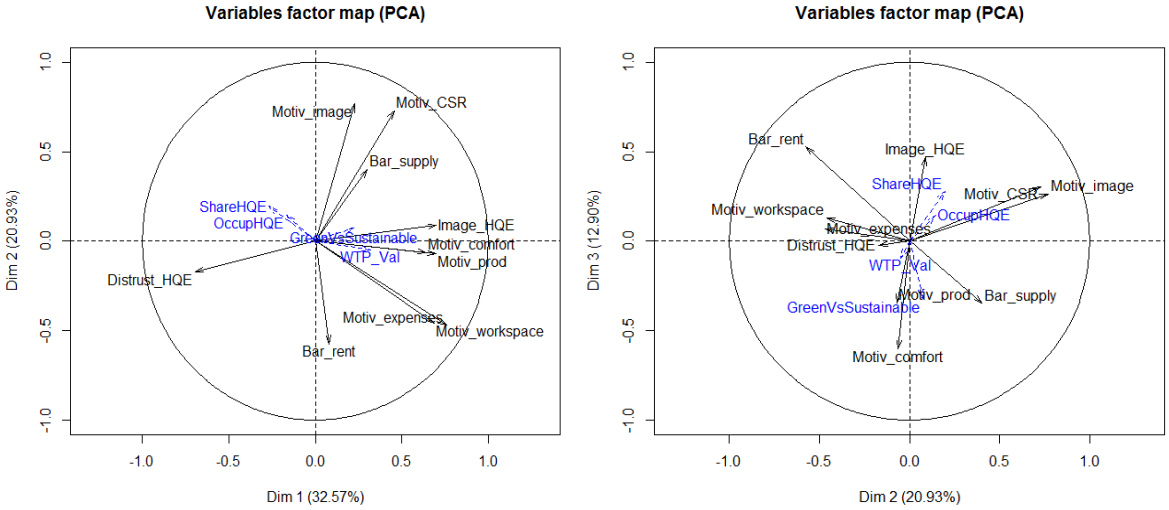


**Figure 34: PCA results on the first two dimensional maps (planes 1-2 and 2-3)**

The first dimension appears strongly positively correlated to the green image of the HQE label (*Image_HQE*), and to the motivations to occupy certified premises associated with expenses reduction (*Motiv_expenses)*, and workspace quality improvements (*Motiv_prod* and *Motiv_comfort)*. This suggests that the trust in the HQE label is paramount for companies motivated by the actual benefits resulting from the occupation of sustainable premises, and is usually associated with a good image of the HQE label. The second dimension is positively correlated with the perception of an insufficient supply of HQE labelled premises (*Bar_supply),* but negatively correlated to *Motiv_expenses* and to the perception of the over expensive rental price of labelled premises (*Bar_rent)*. This suggests that companies mainly motivated by CSR considerations are mainly hindered by the poor supply of HQE labelled premises. The rental level of certified premises does not seem to matter significantly.

The analysis of the individuals factor maps according to the different supplementary variables enables to investigate whether the different motivations are associated with different profiles of companies (see **Appendix 2, Table 29** and **Figure 36).** The first dimension of the PCA does not seem to be associated with any particular profile in terms of industry sectors (*INDUSTRY, SECTOR*). However, differences appear as regards the companies' size (*SIZE, STAFF*) and the existence of dedicated department for corporate real estate (*CREM*). The level of trust in the HQE performance appears to be less important for large companies with a good knowledge of the real estate market. In

addition, companies with a definition of sustainable real estate focused on environmental features (*GreenVsSustainable*) tend to be more distrustful of the HQE brand. The analysis of the second and third dimensions reveals that companies in services appear more motivated by image considerations than companies in industry sectors. However companies' size and the existence of a dedicated corporate real estate department do not appear to have a significant impact on the type of prevailing motivations.

To synthesise, the PCA results highlight three main declared drivers in the motivations to occupy certified premises. First, companies may seek to improve the environmental performance of their premises to reduce their expenses. The trust in the reliability of the HQE label is thus paramount. No specific profile of companies (activity sector, size) is discernable. However, they tend to be an overrepresentation of companies with no dedicated corporate real estate management department. Second, companies may be primarily driven by their global CSR policy and the image conveyed. Renting certified office buildings is thus part of a policy to reflect a corporate responsible image. Companies motivated by such considerations are mainly hindered by the supply of certified office buildings but are not overly affected by the renting level of certified premises. The image of the label as an environmental signal is more important. However, it does not appear as significantly correlated. Last, companies may grant more importance to their employees' condition. Comfort and workplace station are thus paramount.

## 6.3. Impact of perceptions on WTP, move decisions and actual occupations

The willingness-to-pay (WTP) for the occupation of certified premises appears slightly positively correlated with the first dimension (0.32, significant at the 5% level). This suggests a weak positive relation between companies' willingness-to-pay for a premium for certified premises and their prospects of economic benefits resulting from this occupation.

The occupation of HQE premises *(OccupHQE*) is not correlated with any of the three dimensions highlighted by the PCA. This would suggest that the mere occupation of at least one certified building is neither affected by the perception of reliability of the label, nor by the types of prevailing motivations. The result is less contrasted as regards the share of HQE labelled premises (*ShareHQE*) in total office spaces occupation. This variable is weakly negatively correlated (-0.27 significant at the 5% level) to the first dimension associated with the trust in the label, and weakly positively correlated (0.28 significant at the 5% level) with the importance of employees' comfort and good workplace conditions.

This absence of strong relation can be explained by the fact that the occupation of HQE premises may not always result from a deliberate choice. For example, if a company is seeking new premises, it may move into certified premises without specifically seeking the presence of a label, since nearly all new office buildings are certified. In addition, there may be important discrepancies among companies sharing the same motivation. Indeed, companies mainly motivated by CSR issues are composed of all companies having stated to systematically select certified premises, and of companies who have not yet rented any certified premises.

# 7. Mediating effect of the image and trust in the HQE label

To confirm the relations between the motivations to occupy certified premises and the image and trust in the HQE label, the mediation relations suggested in the theoretical framework (see **Figure 29**) are tested. First, I investigate to what extent the image of the HQE label and the distrust in its environmental performance mediate the impact of motivations on the importance of the presence of a HQE label in move decision criteria. Second, I examine the extent to which the ranking of the HQE label in move decision criteria mediates the impact of motivations on the effective occupation of certified premises. Last, I discuss a full model with the two mediations in successive orders.

## 7.1. Presentation of mediation models

A mediating variable corresponds to *"the generative mechanism through which the focal independent variable is able to influence the dependent variable of interest*" (Kenny and Baron, 1986, p.1173). It makes it possible to explain how an independent variable X may indirectly impact a variable Y although a direct relation may not exist. The mediation effect of the relationship between X and Y is thus tested using a series of regressions as pictured in **Figure 35:**

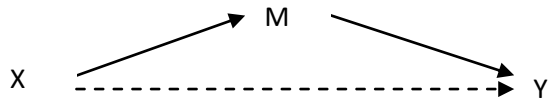


**Figure 35: Mediation of the X,Y relationship by M**

To test for the presence of a mediation effect, the method developed by Zhao *et al.* (2010) is used. They recommend to test the regressions:

(1) $M = a_0 + aX + \varepsilon_0$

(2) $Y = b_1 + bM + cX + \varepsilon_1$

and to use a bootstrap test to verify the significance of the indirect effect (a*b). If the indirect effect is significant, the model confirms the presence of a mediating effect. The analysis is conducted using Preacher and Hayes (2008)'s macro for SPSS with boostrapped samples (1,000). Results on the various simulations are detailed in **Appendix 3**.

## 7.2. Simple mediation of HQE label as a criteria in move decision

Results for the analysis of the mediating effect of the presence of a HQE label in the relations between motivations and actual occupation of HQE premises are presented in **Table 31** in **Appendix 3**.

The consideration of HQE label in move decision criteria has a positive impact on the occupation of HQE premises (0.075 if controlled by Image and CSR motivation, 1.470 if controlled by expenses motivation and 1.320 if controlled by employees' comfort motivation, all significant at the 5% level).

However, there is no significant relation, mediated or not, between the various motivations to occupy certified premises and actual occupation of certified premises. This result is nearly always confirmed when different coding systems are used to examine the importance of HQE label in move decisions (rank or simplified coding). The only exception lies in the mediation between image motivation and effective occupation when the mediating variable considered is the presence of a policy to systematically occupy certified premises.

This model confirms that the occupation of HQE labelled premises does not directly depend on the type of motivation declared by companies, apart from companies motivated by their CSR policies who state they would systematically select certified office premises in their move decisions.

## 7.3. Simple mediation of the image and distrust of HQE label

Results for the analysis of the mediating effect of the perception of the HQE label (image, trust) in the relations between motivations and the importance of the presence of HQE label in move criteria premises are presented are presented in **Table 32** in **Appendix 3**.

Companies motivated by image and CSR tends to be associated with a more positive image of the HQE label than those motivated by the reductions of the expenses and the improvement of employees' comfort (a=0.371, a=0.484, a=0.418 respectively significant at least at the 5% level). Conversely, companies motivated by image and CSR tend to be associated with less distrust in the environmental performance of the HQE label than those motivated by the expenses reductions and the improvement of employees' comfort (a=-0.369 , a=-0.477, a=-0.410 respectively significant at least at the 5% level). On the whole, both the image of HQE label and the distrust in its environmental performance mediates the relations between the motivations and the importance of the label in move decisions (indirect effect a*b significant at least at the 10% level). This mediating effect is more important for companies motivated by actual benefits (a*b= 0.14 for expenses, a*b= 0.12 for employees' comfort) than for those motivated by image (a*b=0.09).

## 7.4. Full model with the two consecutive mediations

Results for the full model with the perception of the HQE label (image and trust) and its importance in move decisions as consecutive mediators of the relations between the motivations and the actual occupation of certified premises are presented in **Table 33** in **Appendix 3**.

When mediating by both the image of the HQE label and the importance of the label in move decision, there is a significant indirect relation between the motivations associated with expenses and employees' comfort and the actual occupation of certified premises (indirect effect size of respectively 0.209 and 0.192 significant at the 10% level). This indirect effect is not significant when considering motivations associated with image and CSR policy.

When mediating by both the distrust in the environmental performance of the HQE label and its importance in move decision criteria, there is a significant indirect relation between all the motivations and the actual occupation of certified premises (indirect effect size of respectively 0.157

for image and CSR, 0.214 for expenses and 0.185 for employees' comfort significant at the 10% level). This indirect effect is higher for image and CSR policy motivations than for motivations associated with concrete benefits through expenses or employees' comfort.

# 8. Summary, practical implications and further perspective

## 8.1. Summary of key results

Results from the survey show that companies' main motive to occupy certified premises dwells in image considerations and their CSR policy. This leads some companies to consider the presence of a HQE label as a decisive criterion when seeking premises. Their positive image of the HQE label as a sustainable brand appears paramount for these companies. Conversely, the distrust in the environmental performance of HQE labelled premises is not a hindrance as long as it has not besmirched the overall "sustainable" image of the label. However, some companies also state expectations on the actual benefits of certified premises (mainly expenses reductions or improved comfort for their employees). In this regard, trust in the performance of the HQE label is paramount for the importance of the HQE label in move decisions. In most cases, both the image of the HQE label and the trust in its environmental performance thus play a mediating role in the decision to select HQE label premises and the actual occupation of certified premises. This tends to suggest that although the brand image of the HQE label is still paramount for the demand for certified office spaces, the environmental performance of the certification may also become an issue.

## 8.2. Practical implications for certification bodies

HQE certification schemes still benefit from a positive image as a sustainable label, helping companies to discriminate between sustainable and non-sustainable premises. However, this situation may not last long as the number of certified premises increases and occupiers gain feedbacks on the occupation of certified premises.

The rise in the number of certified buildings implies a larger pool of sustainable buildings in which companies may choose. Companies motivated by the actual sustainability performance may thus have more leeway to be pickier as regards the environmental performance of their premises. In addition, as corporate real estate managers get feedbacks and reach higher awareness levels on the actual in-use performance of certified premises, the mere presence of a certification may not be sufficient to differentiate certified buildings. Companies may expect more information on the in-use sustainable performance, and may become more demanding as the regards the level of ambition of the certification. Certification schemes will thus probably need to evolve to retain their differentiating effect, in particular through more evidence on the actual performance of labelled premises. Technical and legal conditions to support this shift are already in place. Meters enable occupiers to monitor their energy and water consumption daily. Green leases make it compulsory for

owners and tenants to exchange information on the environmental performance of buildings (waste, energy, water).

In addition, although certification schemes have focused on environmental issues, the other sustainability-related topics should not be left aside. First, some companies highlight expectations as regards employees' comfort and workplace quality. Second, criteria such as comfort conditions, the quality of the workplace, and the flexibility of the indoor layout ranked higher than energy performance and the presence of a certification schemes in respondents' move criteria. These criteria represent examples of differentiating pathways for certification schemes. In this respect, the WELL Label, launched by the US Green Building Council in autumn 2014, may be analysed as competitive move aiming differentiation by focusing on topics valued by companies, health and comfort.

## 8.3. Practical implications for commercialisation

Benefits resulting from the occupation of sustainable premises encompass a wide range of topics from economic gains to human resources management and corporate strategy. However, the selection of office space in move decision does not always involve all the corporate departments that could be impacted by the decisions. Using a survey among the largest French companies, Nappi–Choulet and Dubart (2013) show that the corporate real estate function may depend on the Directorate General (33%), the General Secretariat (23%), the financial department (16%), the Human Resources Department (7%) or on other functions.

However, the analysis of commercial brochures for certified office spaces show that the presence of certification schemes and more globally sustainability-related features are still presented separately from expenses considerations and the quality of occupation (connectivity in public transit, comfort, flexibility in the indoor layout, etc.). This does not help occupiers to associate certification schemes with potential occupation benefits. A more integrated presentation of sustainability-related features with information on the individual sustainability-related features presented jointly with occupation quality and their benefits for occupiers could help better inform occupiers and foster decisions that do not only rely on location and rental levels. In a research publication, the transaction advisor Jones Lang LaSalle (JLL) has attempted such type of communication[46]. However, it is mostly a research tool and is still far from typical commercial brochures used to present the characteristics of office spaces during commercialisation.

## 8.4. Suggestions for further research

This paper alludes to the fact that the occupation of certified premises does not always result from deliberate companies' decisions. They may sometimes be merely a side effect of their moving into new office buildings since three fourths of the supply of office buildings in the Greater Paris Region are certified. In the survey, some companies did not ranked HQE label at all when considering move

[46] Jones Lang LaSalle (2013) *Vos bureaux vous rapportent ! Quelle contribution de l'espace de travail à la performance de l'entreprise.*

decision. This distinction could be investigated further, in particular when considering the impact of locations.

In addition, the analysis only concerns the HQE label for the construction or renovation stage of the buildings (HQE Construction or HQE Renovation). However, this label has also been adapted to the operation phase through the label HQE Exploitation. When the survey was designed, the HQE Exploitation label was still merely emerging. As such, companies not willing to move in new premises had little choice as regards certified premises. With the development of in use-labels, this is no longer the case. The differentiating effect of the HQE label (image or trust) could be even more crucial with HQE Exploitation label and would be very interesting to investigate.

Last but not least, preliminary interviews with occupiers tended to prove that corporate real estate managers do not discriminate yet according to the different levels of performance of the certification schemes. Further research could be dedicated to this topic.

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# Appendix 1: Descriptive statistics

NB: Only the statics corresponding to the sub sample (60 respondents) with fully answered questionnaires are presented below. A comparison with the total sample (76 respondents) shows small discrepancies, in particular as regards the proportion of companies with certified premises.

### *Profile of the respondents*

| | | Total | Occupation of certified premises? | | Move decision s? | | HQE criteria in move decision | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | yes | no | yes | no | 0:not ranked | 1: ranked but not first | 2:ranked first | No move |
| **SECTOR** | INDUSTRY | 22 | 44% | 29% | 40% | 29% | 30% | 50% | 40% | 29% |
| | SERVICES | 38 | 56% | 71% | 60% | 71% | 70% | 50% | 60% | 71% |
| **STAFF** | Less than 500 | 8 | 3% | 25% | 9% | 24% | 20% | 0% | 0% | 24% |
| | Between 500 and 1000 | 3 | 3% | 7% | 5% | 6% | 5% | 0% | 20% | 6% |
| | More than 1000 | 49 | 94% | 68% | 86% | 71% | 75% | 100% | 80% | 71% |
| **PREMISES** | Between 1 and 10 | 14 | 16% | 32% | 19% | 35% | 25% | 17% | 0% | 35% |
| | Between 11 and 50 | 8 | 16% | 11% | 14% | 12% | 10% | 11% | 40% | 12% |
| | More than 50 | 38 | 69% | 57% | 67% | 53% | 65% | 72% | 60% | 53% |
| **CREM** | CREM | 28 | 56% | 36% | 49% | 41% | 45% | 56% | 40% | 41% |
| | NO CREM | 32 | 44% | 64% | 51% | 59% | 55% | 44% | 60% | 59% |

CREM : presence of a dedicated Corporate real estate management team

**Table 23: Respondents' profile**

### *Perception of HQE label*

| | | Min | Mean | Max | Std | Total |
|---|---|---|---|---|---|---|
| **Definition of sustainable real estate** | Energy | 3 | 3,750 | 4 | 0,433 | 60 |
| | Water | 2 | 3,133 | 4 | 0,645 | 60 |
| | Environmental footprint | 2 | 2,950 | 4 | 0,693 | 60 |
| | Comfort | 2 | 3,467 | 4 | 0,618 | 60 |
| | Accessibility | 2 | 3,667 | 4 | 0,506 | 60 |
| | Workspace | 2 | 3,333 | 4 | 0,596 | 60 |
| **Eco labels image** | ImageHQE | 1 | 3,267 | 4 | 0,854 | 60 |
| | Image BBC | 0 | 2,833 | 4 | 1,035 | 60 |
| | Image BEPOS | 0 | 2,333 | 4 | 1,457 | 60 |
| | Image In Use Labels | 0 | 2,733 | 4 | 1,302 | 60 |
| **Motivations** | Expenses savings | 1 | 3,267 | 4 | 0,854 | 60 |
| | Workspace optimisation | 1 | 2,850 | 4 | 0,792 | 60 |
| | Comfort | 1 | 3,017 | 4 | 0,741 | 60 |
| | Productivity gains | 1 | 2,483 | 4 | 0,785 | 60 |
| | Image | 1 | 3,183 | 4 | 0,719 | 60 |
| | CSR Policy | 1 | 3,467 | 4 | 0,645 | 60 |
| **Barriers** | Higher rent | 2 | 3,033 | 4 | 0,706 | 60 |
| | Lack of supply | 1 | 2,983 | 4 | 0,826 | 60 |
| **Trust/ reliability** | Higher operative costs | 1 | 2,233 | 4 | 0,782 | 60 |
| | Performance not proven | 1 | 2,400 | 4 | 0,879 | 60 |

**Table 24: Statistics on the perception of HQE Label by the respondents**

### *Occupation of HQE certified premises*

| | | Total | % |
|---|---|---|---|
| **Occupation of certified premises** | Yes | 32 | 53% |
| | No | 28 | 47% |
| **Holding certified** | Yes | 11 | 18% |
| | No | 49 | 82% |
| **Share of HQE premise** | No HQE premises | 28 | 47% |
| | Between 0% and 5% | 15 | 25% |
| | Between 5% and 20% | 6 | 10% |
| | Between 20% and 50% | 8 | 13% |
| | More than 50% | 3 | 5% |
| **Satisfaction with HQE certified premises** | No HQE premises | 28 | 47% |
| | Yes absolutely | 3 | 5% |
| | Yes moderately | 21 | 35% |
| | No, not really | 5 | 8% |
| | No, not at all | 3 | 5% |
| ***Number of respondents*** | | | *60* |

**Table 25 : Statistics on the occupation of certified premises by the respondents**

### *Criteria in move decisions*

NB: answers were collected only for the 70% of the sample who had a move decision in the past three years.

| **Ranking** (1 very important, 7 not considered) | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| **Ranking of criteria in past move decisions** | **Location** | 81% | 17% | 0% | 0% | 2% | 0% | 0% |
| | **Rental level** | 52% | 36% | 5% | 0% | 0% | 2% | 5% |
| | **Aesthetics** | 10% | 19% | 21% | 12% | 12% | 12% | 14% |
| | **Energy performance** | 5% | 29% | 31% | 19% | 0% | 10% | 7% |
| | **Environmental label** | 9% | 16% | 19% | 23% | 5% | 7% | 21% |
| | **Indoor configuration** | 10% | 36% | 19% | 12% | 10% | 12% | 2% |
| | **Workspace optimisation** | 14% | 36% | 14% | 12% | 12% | 2% | 10% |
| | **Flexibility** | 21% | 31% | 14% | 17% | 7% | 2% | 7% |

**Table 26: Criteria ranking in past move decisions**

NB: This ranking was thus used to create a scale for each criteria with: 0 if not considered (or ranked last), 2 if ranked first, and 1 otherwise. Several other scales were tested, leading to similar results.

| | | Min | Mean | Max | Std | Total |
|---|---|---|---|---|---|---|
| **Criteria in move decision** | Move_HQEcriteria | 0 | 0,651 | 2 | 0,678 | 60 |
| | Move_Energycriteria | 0 | 0,881 | 2 | 0,447 | 60 |
| | Move_Comfortcriteria | 0 | 0,837 | 2 | 0,568 | 60 |
| | Move_match_HQE | 0 | 2,140 | 4 | 1,231 | 60 |
| **Current comfort conditions** | Current_workspace | 1 | 3,366 | 5 | 0,649 | 60 |
| | Current_green | 1 | 2,900 | 5 | 0,721 | 60 |
| | Current_comfort | 1 | 3,222 | 5 | 0,675 | 60 |
| **Willingness to pay** | WTP | 0 | 0,400 | 1 | 0,490 | 60 |
| | WTP_Val | 0 | 0,717 | 3 | 0,985 | 60 |

**Table 27 : Importance of criteria in past move decisions, satisfaction with current conditions and willingness-to-pay to improve environmental features**

# Appendix 2 : Results from the PCA analyses

| | Eigenvalue | Percentage of variance | Cumulative percentage of variance |
|---|---|---|---|
| **Dim 1** | 3.26 | 32.57 | 32.57 |
| **Dim 2** | 2.09 | 20.93 | 53.51 |
| **Dim 3** | 1.29 | 12.90 | 66.40 |
| **Dim 4** | 0.89 | 8.91 | 75.32 |
| **Dim 5** | 0.78 | 7.84 | 83.16 |

**Table 28: Eigenvalues and percentage of variance explained**

| | coordinates | | | Cosinus² | | | contributions | | |
|---|---|---|---|---|---|---|---|---|---|
| **Active variables** | **Dim.1** | **Dim.2** | **Dim.3** | **Dim.1** | **Dim.2** | **Dim.3** | **Dim.1** | **Dim.2** | **Dim.3** |
| Image_HQE | 0.70 | 0.09 | 0.47 | 0.49 | 0.01 | 0.22 | 15.01 | 0.38 | 17.23 |
| Motiv_expenses | 0.76 | -0.47 | 0.07 | 0.57 | 0.22 | 0.00 | 17.55 | 10.55 | 0.37 |
| Motiv_workspace | 0.69 | -0.46 | 0.13 | 0.47 | 0.21 | 0.02 | 14.42 | 10.13 | 1.34 |
| Motiv_comfort | 0.64 | -0.06 | -0.60 | 0.41 | 0.00 | 0.36 | 12.53 | 0.19 | 28.22 |
| Motiv_prod | 0.70 | -0.07 | -0.34 | 0.48 | 0.01 | 0.12 | 14.84 | 0.25 | 9.19 |
| Motiv_image | 0.23 | 0.77 | 0.27 | 0.05 | 0.59 | 0.07 | 1.58 | 28.23 | 5.45 |
| Motiv_CSR | 0.45 | 0.73 | 0.31 | 0.21 | 0.53 | 0.09 | 6.33 | 25.37 | 7.27 |
| Bar_rent | 0.08 | -0.57 | 0.53 | 0.01 | 0.33 | 0.28 | 0.20 | 15.79 | 21.55 |
| Bar_supply | 0.30 | 0.40 | -0.35 | 0.09 | 0.16 | 0.12 | 2.74 | 7.69 | 9.36 |
| Distrust_HQE | -0.69 | -0.17 | -0.02 | 0.48 | 0.03 | 0.00 | 14.81 | 1.41 | 0.04 |
| **Supplementary quant. variables** | **Dim.1** | **Dim.2** | **Dim.3** | **Dim.1** | **Dim.2** | **Dim.3** | | | |
| OccupHQE | -0.17 | 0.15 | 0.14 | 0.03 | 0.02 | 0.02 | | | |
| ShareHQE | -0.27 | 0.19 | 0.28 | 0.07 | 0.04 | 0.08 | | | |
| WTP_Val | 0.32 | -0.05 | -0.09 | 0.10 | 0.00 | 0.01 | | | |
| GreenVsSustainable | 0.22 | 0.07 | -0.32 | 0.05 | 0.01 | 0.10 | | | |
| **Supplementary qual variables** | **Dim.1** | **Dim.2** | **Dim.3** | **Dim.1** | **Dim.2** | **Dim.3** | | | |
| INDUSTRY | 0.09 | -0.29 | -0.25 | 0.03 | 0.30 | 0.21 | | | |
| SERVICES | -0.05 | 0.17 | 0.14 | 0.03 | 0.30 | 0.21 | | | |
| Between 1 and 10 premises | 0.46 | 0.55 | 0.16 | 0.34 | 0.50 | 0.04 | | | |
| Between 11 and 50 premises | -0.17 | 0.08 | 0.19 | 0.11 | 0.03 | 0.13 | | | |
| More than 50 pemises | -0.13 | -0.22 | -0.10 | 0.20 | 0.56 | 0.11 | | | |
| Less than 500 employees | 0.56 | 0.83 | -0.04 | 0.25 | 0.55 | 0.00 | | | |
| Between 500 and 1000 employees | -0.78 | 1.06 | -0.99 | 0.16 | 0.29 | 0.26 | | | |
| More than 1000 employees | -0.04 | -0.20 | 0.07 | 0.04 | 0.76 | 0.09 | | | |
| CREM | -0.22 | 0.04 | 0.03 | 0.72 | 0.02 | 0.01 | | | |
| NOCREM | 0.19 | -0.03 | -0.03 | 0.72 | 0.02 | 0.01 | | | |

**Table 29: Coordinates and contributions of the active and supplementary variables**

| | correlation | p.value |
|---|---|---|
| **Motiv_expenses** | 0,7560 | 2,88E-12 |
| **Image_HQE** | 0,6991 | 5,21E-10 |
| **Motiv_prod** | 0,6952 | 7,11E-10 |
| **Motiv_workspace** | 0,6853 | 1,54E-09 |
| **Motiv_comfort** | 0,6388 | 3,96E-08 |
| **Motiv_CSR** | 0,4542 | 2,68E-04 |
| **WTP_Val** | 0,3183 | 1,32E-02 |
| **Bar_supply** | 0,2988 | 2,04E-02 |
| **ShareHQE** | -0,2681 | 3,83E-02 |
| **Distrust_HQE** | -0,6945 | 7,51E-10 |

| | correlation | p.value |
|---|---|---|
| **Motiv_image** | 0,7687 | 7,40E-13 |
| **Motiv_CSR** | 0,7288 | 4,08E-11 |
| **Bar_supply** | 0,4013 | 1,48E-03 |
| **Motiv_workspace** | -0,4605 | 2,13E-04 |
| **Motiv_expenses** | -0,4700 | 1,51E-04 |
| **Bar_rent** | -0,5750 | 1,55E-06 |

| $Dim.3 | correlation | p.value |
|---|---|---|
| **Bar_rent** | 0,5271 | 1,51E-05 |
| **Image_HQE** | 0,4714 | 1,44E-04 |
| **Motiv_CSR** | 0,3061 | 1,74E-02 |
| **ShareHQE** | 0,2800 | 3,03E-02 |
| **Motiv_image** | 0,2651 | 4,07E-02 |
| **GreenVsSustainable** | -0,3198 | 1,27E-02 |
| **Motiv_prod** | -0,3442 | 7,09E-03 |
| **Bar_supply** | -0,3475 | 6,52E-03 |
| **Motiv_comfort** | -0,6032 | 3,38E-07 |

NB: Only the correlations with p.value inferior to 0.05 are described.

**Table 30: Correlations between the PCA dimensions and the quantitative variables**

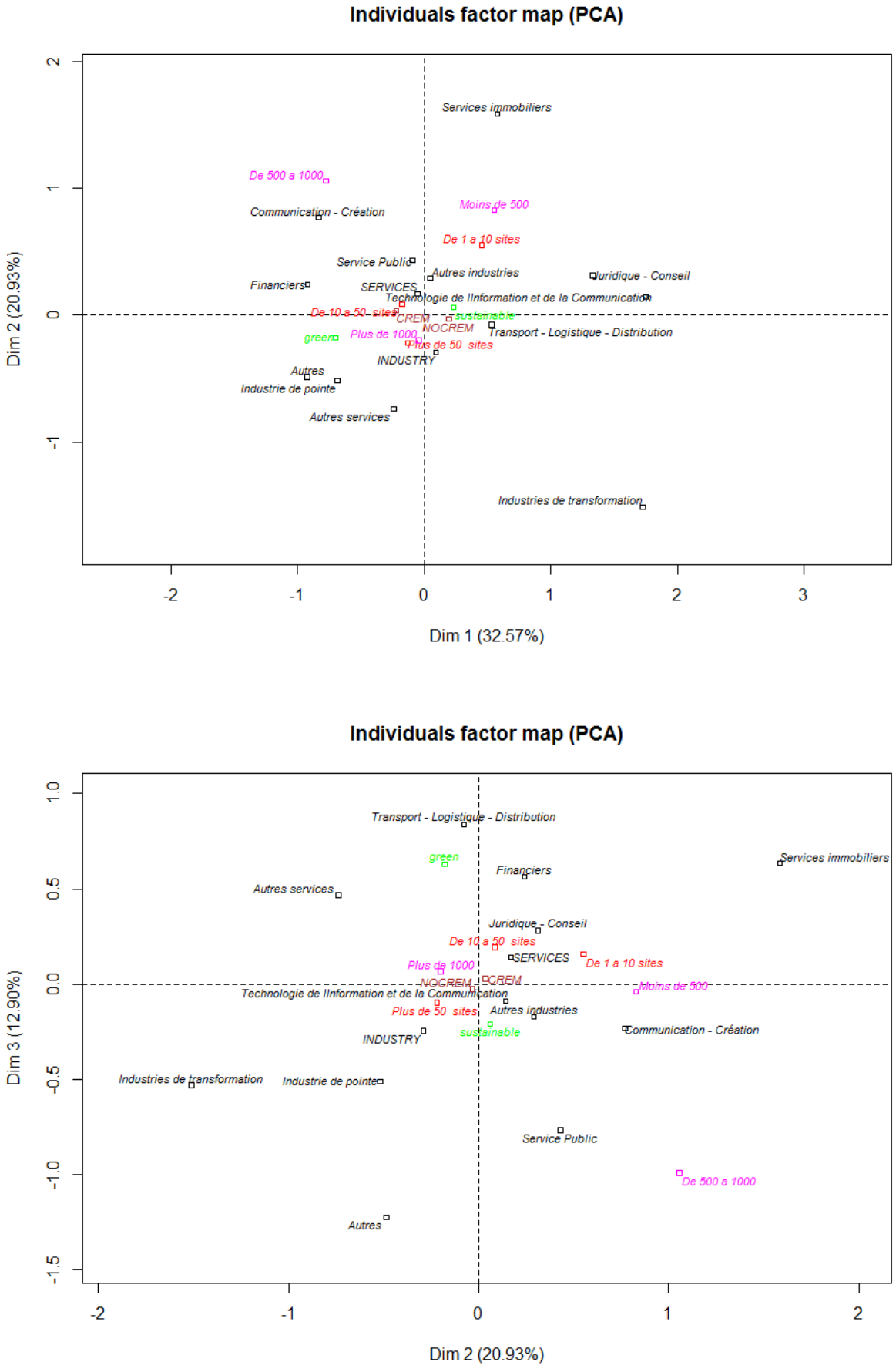


**Figure 36: Barycenter of the supplementary variables in the two first individual factor maps**

# Appendix 3: Mediation models

### *Simple mediation of the HQE label as a move criteria in the relation between the motivations and the occupation of HQE certified premises*

Model:

(1) $M = a_0 + aX + \varepsilon_0$

(2) $Y = b_1 + bM + cX + \varepsilon_1$

Results:

| X | M | Y | a | b | c | a*b |
|---|---|---|---|---|---|---|
| **Motiv_imageCSR** | **Move_HQEcriteria** | **OccupHQE** | 0.075 | 1.262 ** | 0.300 | 0.095 |
| **Motiv_expenses** | **Move_HQEcriteria** | **OccupHQE** | 0.048 | 1.470 ** | -0.804 | 0.071 |
| **Motiv_employees** | **Move_HQEcriteria** | **OccupHQE** | -0.011 | 1.320 ** | -0.400 | -0.014 |

* signif at the 10% level

** signif. at the 5% level

*** signif. at the 1% level

**Table 31: Results of the simple mediation models between motivations and occupation**

### *Simple mediation of the image and distrust of HQE label in the relation between motivation and the ranking of HQE label as a decision criteria*

Model:

(1) $M = a_0 + aX + \varepsilon_0$

(2) $Y = b_1 + bM + cX + \varepsilon_1$

Results:

| X | M | Y | a | b | c | a*b |
|---|---|---|---|---|---|---|
| **Motiv_imageCSR** | **Distrust_HQE** | **Move_HQEcriteria** | -0.369 ** | -0.251 ** | -0.018 | 0.093 ** |
| **Motiv_expenses** | **Distrust_HQE** | **Move_HQEcriteria** | -0.477 *** | -0.283 ** | -0.087 | 0.135 ** |
| **Motiv_employees** | **Distrust_HQE** | **Move_HQEcriteria** | -0.410 *** | -0.301 ** | -0.134 | 0.123 ** |
| **Motiv_imageCSR** | **Image_HQE** | **Move_HQEcriteria** | 0.374 ** | 0.242 * | -0.015 | 0.090 * |
| **Motiv_expenses** | **Image_HQE** | **Move_HQEcriteria** | 0.484 *** | 0.279 * | -0.087 | 0.350* |
| **Motiv_employees** | **Image_HQE** | **Move_HQEcriteria** | 0.418 *** | 0.300 ** | -0.136 | 0.126 ** |

* signif at the 10% level

** signif. at the 5% level

*** signif. at the 1% level

**Table 32: Results of the simple mediation models between motivations and move criteria**

***Full model with the two consecutive mediations in the relation between the motivations to occupy certified premises and the occupation of certified premises***

Model:

(1) $M1 = a_0 + aX + \varepsilon_0$

(2) $M2 = b_1 + bM1 + cX + \varepsilon_1$

(3) $Y = d_1 + dM1 + eM2 + fX + \varepsilon_2$

Ind. effect 1: X->M1 -> Y

Ind. effect 2: X->M1 -> M2

Ind. effect 3: X->M2 -> Y

Results:

| X | M1 | M2 | Y | a | b | c | d | e | f |
|---|---|---|---|---|---|---|---|---|---|
| **Motiv_imageCSR** | **Image_HQE** | **Move_HQEcriteria** | **OccupHQE** | 0.374 ** | 0.242 * | -0.015 | -0.898 * | 1.724 ** | 0.694 |
| **Motiv_expenses** | **Image_HQE** | **Move_HQEcriteria** | **OccupHQE** | 0.484 *** | 0.279 * | -0.087 | -0.226 | 1.547 ** | -0.691 |
| **Motiv_employees** | **Image_HQE** | **Move_HQEcriteria** | **OccupHQE** | 0.418 *** | 0.300 ** | -0.136 | -0.471 | 1.526 ** | -0.231 |
| **Motiv_imageCSR** | **Distrust_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.369 ** | -0.251* | -0.018 | 0.785 | 1.695 ** | 0.628 |
| **Motiv_expenses** | **Distrust_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.477 *** | -0.283 ** | -0.087 | 0.264 | 1.585 ** | -0.699 |
| **Motiv_employees** | **Distrust_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.410 *** | -0.301 ** | -0.134 | 0.402 | 1.495 ** | -0.218 |

* signif at the 10% level

** signif. at the 5% level

*** signif. at the 1% level

| X | M1 | M2 | Y | Ind. effect 1 | Ind. effect 2 | Ind. effect 3 |
|---|---|---|---|---|---|---|
| **Motiv_imageCSR** | **Image_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.336 | 0.156 | -0.027 |
| **Motiv_expenses** | **Image_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.109 | 0.209 * | -0.134 |
| **Motiv_employees** | **Image_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.197 | 0.192 * | -0.208 |
| **Motiv_imageCSR** | **Distrust_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.290 | 0.157 * | -0.03 |
| **Motiv_expenses** | **Distrust_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.126 | 0.214 * | -0.138 |
| **Motiv_employees** | **Distrust_HQE** | **Move_HQEcriteria** | **OccupHQE** | -0.165 | 0.185 * | -0.200 |

* signif at the 10% level

** signif. at the 5% level

*** signif. at the 1% level

**Table 33: Results of the full mediation model**

# PART 3

# Impact of sustainability-related topics on the long term value of buildings

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This section focuses on impact of sustainability-related trends on the long term value of the building stock and investment decision-making process.

**Chapter 5** thus analyses the impact of the rise of sustainability-related concerns on the long term value of real estate from an obsolescence angle. After a theoretical discussion on the concept of obsolescence, empirical evidence from the literature review and the French context are used to identify how this new factor of obsolescence is tackled by investors. A theoretical framework is thus proposed, based on the analysis of cycles of refurbishment works to meet the rising sustainability-related expectations.

# CHAPTER 5: Obsolescence resulting from the rise of sustainability concerns and integration into investment decisions

## 1. Introduction

### 1.1. Background

Building owners and investors have a key role to play in the sustainability agenda of the real estate sector. Through the integration of sustainability-related criteria in their investment decision-making process (development of new buildings, purchase of existing assets, investment for retrofits and deep refurbishments), they contribute to the improvement of the sustainability performance of the building sector.

The real challenge to improve the overall impact of the building sector rests on the improvement of the existing building stock (EEFIG, 2015). Accounting for sustainability for new buildings seems relatively mapped out through building codes and the use of sustainability credentials such as BREAM, LEED, HQE, DGNB, etc. Improving the sustainability performance of the building stock appears less straightforward. The proportion of new buildings constructed each year and contributing to the renewal of the stock does not exceed 1% (EEFIG, 2015). This will not be sufficient to meet the sustainability agenda. Broader measures to improve the sustainability performance of the existing buildings are required. Yet, tackling the building stock is challenging (Kohler and Hassler, 2002). It first requires mapping out the performance level, then identifying and implementing measures in a constrained context (allocated budgets, occupancy schedule, building code and built heritage preservation, etc.).

In addition, investors who do not tackle sustainability issues in their existing portfolio may face additional financial risks. Indeed, the financial performance of the building stock will most probably be affected by the rise of sustainability issues. A large bulk of literature (including Wiley *et al.* (2010), Eichholtz *et al.* (2010), Fuerst and McAllister (2011), Chegut *et al.* (2014), etc.) has showed that sustainable buildings benefitted from a market value premium. However, (Chegut *et al.*, 2014) suggest that this premium is likely to decrease as the supply of sustainable buildings increases, due to a volume effect. In addition, some authors (Wiley *et al. (*2010) and Runde and Thoyre (2010) among others) wonder whether it will effectively remain a "*green premium*" for sustainable buildings or whether it will rather translate into a "*brown discount*" for existing buildings with poor sustainability performance. As early as 2005, the risk of obsolescence is briefly mentioned as a possible consequence of the rise of sustainability issues (Reed and Wilkinson, 2005). Some brokers and advisors have relayed the belief and warned investors of the risks of accelerated obsolescence for existing buildings (JLL, 2013; DTZ, 2013).

However, empirical evidence about how investors currently tackle this risk of accelerated obsolescence, and theoretical frameworks to model this obsolescence have been relatively

unexplored. A communication from Reed and Warren-Myers (2010) has indeed investigated how sustainability-related topics could be considered as a new factor of obsolescence. Yet, they mainly focus on the integration of sustainability-related features into replacement costs and neglect dynamic aspects associated with future trends. I built on this seminal paper to clarify further the concepts (obsolescence, retrofits and resilience associated with sustainability) and propose a long term perspective which seem more relevant to the shifting nature of sustainability concerns.

## 1.2. Research approach

This chapter focuses on investors' point of view and proposes a framework to examine the integration of sustainability-related concerns into investment decisions for the building stock. In particular, I question the extent to which the rise of sustainability-related concerns appears as a factor of obsolescence, which is tackled through retrofits and refurbishments.

First, I investigate investors' perceptions of sustainability-related topics and their practices as regards the management of sustainability concerns for their existing portfolios. Evidence is drawn from a review of literature as well as statistical data on the French context. In particular, I use responses and interviews to an annual survey conducted for Novethic, a French research centre on responsible investment. This helps me gain insight on how practices have evolved, and allows me to benefit from more up-to-date information. I also carry out a review of tools proposed by real estate advisors to support decision-making process. I thus demonstrate that sustainability-related features have increasingly been perceived as an additional risk of obsolescence for existing buildings, but have usually been treated with low costs short-term solutions.

Second, I suggest that these one-shot upgrades with little ambition could have counterproductive effects on the long term management of sustainability performance and associated obsolescence. For illustration purposes, I develop a theoretical dynamic modelling to highlight the importance of life cycle accounting in sustainability upgrades decisions. This modelling is inspired by sequential infinite valuation model well used in forest economics for managing existing forest stock.

Last, I discuss how the long term impact of sustainability-related concerns could be better accounted for in the management of the existing building stock.

## 1.3. Structure of the paper

**Section 2** investigates further the notion of obsolescence and how it is traditionally managed by investors. **Section 3** examines how investors tackle sustainability. It suggests that sustainability-related concerns have increasingly been perceived as a factor of risks and obsolescence for existing buildings. **Section 4** investigates more closely decision-support tools for sustainability upgrades and the treatment of sustainability-related obsolescence. To highlight risks on the long term management of sustainability-related obsolescence, **Section 5** utilises a dynamic model to investigate sustainability upgrades over the whole building life cycle. Last section concludes with perspectives for further research.

# 2. Sustainability, building quality and obsolescence

To investigate to what extent investors consider the impact of sustainability on their building stock as a new factor of obsolescence, this section examines what obsolescence is and how it relates to building quality and building depreciation. I first present definitions before discussing how this concept can apply to sustainability features. I show that the rise of sustainability preoccupations can indeed be analysed as an additional factor of obsolescence for the existing building stock.

## 2.1. Physical deterioration, obsolescence and depreciation

In traditional real estate literature, obsolescence is defined as "*a decline in utility not directly related to physical usage or the passage of time*" (Baum, 1993, p. 545)[47]. Obsolescence must be distinguished from physical deterioration, which relates to the physical lifespan of building components and physical conditions. Reference to "utility" involves that obsolescence depends on perceptions in a given context. A building may be perceived as obsolete by a given user but not by another. Obsolescence does not mean that the building is defective, but that it no longer meets expectations. It relates to the uses and services buildings no longer provide as compared to the evolutions of market standards. The evolution of the market explains that the service life[48] of a building (i.e. its duration in use) will differ from its physical lifespan (associated with the physical life span of its components) (Langston, 2011).

Different types of obsolescence may be distinguished according to the underlying cause (Baum, 1993; Bottom *et al*., 1999; Mansfield, 2000). Building on Bryson (1997), Pinder and Wilkinson (2000b) and Mansfield and Pinder (2008), this paper differentiates between functional and economic obsolescence.

Functional obsolescence (also called building obsolescence) stems from changes in the expectations of tenants and other stakeholders. It corresponds to "*the degree of match between organizational requirements and design/quality characteristics afforded by the office at a particular time*" (Bottom *et al.,* 1999, p.345). Functional obsolescence may thus be explained by building intrinsic characteristics and occurs when these characteristics no longer match requirements. Legal, technological and social obsolescences can be considered as sub-categories of functional obsolescence (Baum, 1993; Mansfield and Pinder, 2008) as they result from external requirements. Legal obsolescence includes the non-compliance with regulations and legal procedures, which are requirements from government and local authorities. Technological obsolescence refers to improvements in technology that result in building components being less desirable than their new

[47] This definition has been widely used in the academic literature. However, the distinction between physical deterioration and obsolescence is less clear in operational publications. In particular, the RICS Red Book mentions "physical obsolescence" to refer to physical deterioration. For further discussion on this confusion, see Mansfield and Pinder (2008).

[48] Definition of "service life" in the ISO 15686-1:2011 standard: "*period of time after installation during which a facility or its component parts meet or exceed the performance requirements*".
Definition of "obsolescence" in the ISO 15686-1:2011 standard: "*loss of ability of an item to perform satisfactorily due to changes in performance requirements*".

replacements. Social obsolescence stems for social changes (e.g. new ways of working), which require adaptations in building features.

Economic obsolescence (also called locational obsolescence) refers to factors associated with the building site, such as a change in the best use for a given location, modifications in infrastructures and services provided near the property site or new constructions perceived as having negative amenities (high voltage transmission lines, industrial plants, etc.) (Mansfield and Pinder, 2008). As opposed to functional obsolescence, economic obsolescence stems from external factors influencing the land value (Bryson, 1997).

From a financial point of view, obsolescence corresponds to a mismatch between demand and supply resulting in lower rental values, higher vacancy rates and lower market value. Obsolescence should be distinguished from depreciation, which refers to the general decrease of financial value over time due to both obsolescence and physical deterioration (Baum, 1993). **Figure 37** synthesizes the relationship between depreciation, obsolescence and physical deterioration.

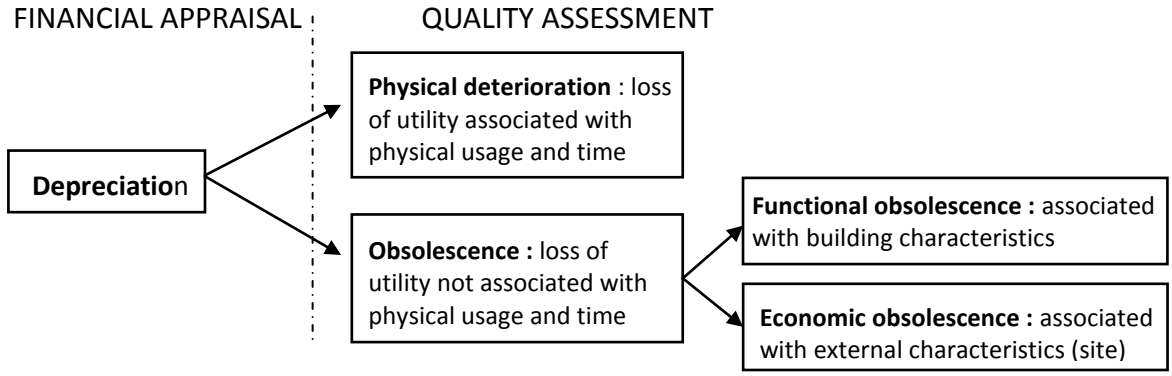



**Figure 37: Depreciation, obsolescence and physical deterioration**

## 2.2. Building quality and obsolescence

Functional obsolescence is traditionally analysed by an assessment of the building quality (Baum, 1993; Bottom *et al.,* 1999; Pinder and Wilkinson, 2000). Building quality corresponds to an assessment of building characteristics and related performance. Along these lines, quality refers to an evolving benchmark. For example, building perceived as high quality buildings in the 80s for their large pipes accommodating telecommunications cables will no longer be deemed as high quality today when such installations no longer serve any purpose. The assessment of building quality against a benchmark is paramount since expectations can differ according to the type of buildings, tenants and owners.

Baum (1993) distinguishes four main quality categories to counter obsolescence: configuration (plan layout, floor-to-ceiling height), internal specification, external appearance and quality of materials. He demonstrates that building quality ranks higher than deterioration to explain building depreciation. Bottom *et al. (*1999) focus on the matching between occupiers' expectations and building characteristics at a given date and compare the building characteristics with a checklist from occupiers. More recently, Pinder and Wilkinson (2000a) have proposed the use of gap analysis, a

marketing method comparing the services provided to the services expected by the users, using responses of individual employees.

This chapter examines obsolescence as the mismatch between occupants' perceptions of the quality of the building on the one hand and market standards and occupants' expectations on the other hand. The general framework adopted is illustrated in **Figure 38.** Building quality is considered to be decreasing over time due to physical deterioration and the loss of utility of updated features. Occupants' and market's expectations are assumed to be rising over time due to more stringent regulations and higher expectations on the comfort, adaptability and efficiency of the workplace.

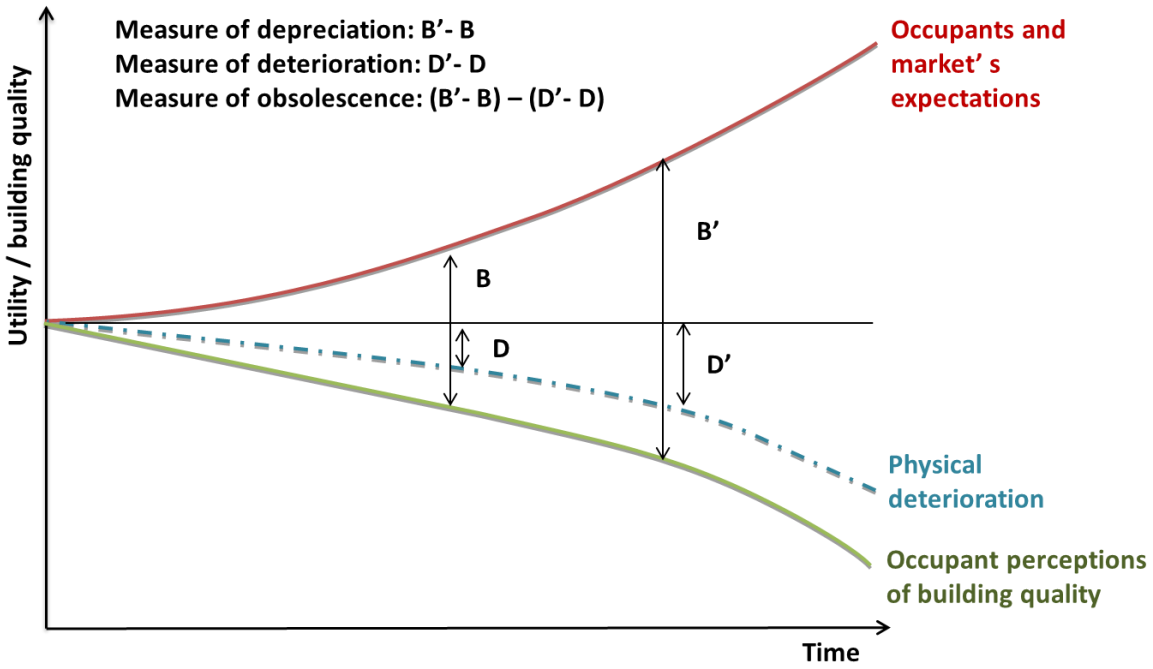



**Figure 38: Description of obsolescence (modified and completed from Pinder and Wilkinson, 2000b)**

## 2.3. Sustainability concerns as a factor of obsolescence

As a constituent of building quality and a rising expectation from market players, sustainability can be analysed using the framework presented previously. I argue it may be considered as a factor of obsolescence.

Several studies have already referred to sustainability-related concerns as a factor of obsolescence, liable to increase financial risks for buildings which do not comply with sustainability market standards (Reed and Wilkinson, 2005; Reed and Warren-Myers, 2010; RICS, 2013). The underlying idea is that the rise of sustainability-related preoccupations translates into shifts in market players' expectations (regulation bodies, occupiers, other investors, local authorities) that affect the financial performance of existing buildings. For example, new regulations may result in risks of non-compliance. New certification schemes may imply that occupiers seeking labelled premises overlook non certified buildings when selecting premises. Local authorities developing eco-neighbourhood may penalize poorly performing existing buildings and require their refurbishments. Erreur ! Source du renvoi introuvable. lists some mechanisms which may explain how the rise of sustainability-related concerns could result in obsolescence.

| Source | Mechanisms | Examples |
|---|---|---|
| Legal | Changes in building regulation | Energy regulation for new constructions and retrofits, indoor air quality regulation, etc. |
| | Changes in CSR regulation | Mandatory non-financial disclosure |
| | Changes in the taxation system | New carbon tax |
| Market | Rise of utilities prices | Rise of electricity prices |
| | Development of voluntary standards | Diffusion of HQE, BREEAM, LEED, DGNB labels<br>Strengthening of the ambitions of these labels |
| Technological | New technology for building components and technical installations | Development of new generations of boilers, new insulation materials, etc. |
| | New technology for sustainability performance measurement | Development of smart meters |
| Social | Workplace transformation | Development of collaborative workplaces |
| | Shift in mobility practices | Development of bicycling |
| External | Development of sustainable neighbourhoods | Development of smart grids, which would create differentiations between locations |
| | Adaptation to climate change and natural events | Multiplication of summer comfort issues, of flooding |

**Table 34: Potential sources of sustainability-related obsolescence**

As sustainability-related features become mainstream for new developments and retrofits, existing buildings with poor sustainability performance are liable to lose attractiveness for both users in the rental market and investors in the asset market. The rise of sustainability-related concerns could thus translate into differentiated rental levels, differentiated risks perceptions and associated capitalization rates resulting into differentiated market values (Sayce *et al.*, 2007; etc.), but also into differentiated insurance premiums and interest rates (UNEP FI, 2014b). Large companies are already increasingly seeking sustainable properties, refusing to occupy non certified office buildings for their front office and recently built headquarters (DTZ-Novethic, 2013). Similarly, leading investors could invest primarily on sustainable buildings leaving out poorly performing buildings in their asset selection.

This argumentation is supported by research on mature cities and their nearly constant stock (see Languillon-Aussel, 2015). If we consider the Greater Paris Region as a mature city, its existing building stock can be considered as nearly constant. New supply of high quality buildings thus leads to a transfer of market players from older buildings to newer more sustainable buildings. However, this transfer could be hindered by various factors. First, if these transfer mechanisms generate price differentiation, some market players may still prefer the older buildings, which would be less expensive. A market segmentation would thus take place, with on the one hand a market composed of new sustainable high quality premises, and on the other hand a market comprising only cheap lower quality buildings. Second, this transfer may be limited if the quality of the new type of premises is not significantly perceived as better than that of the existing buildings. The actual sustainability performance (see **Chapter 3**) thus appears paramount.

# 3. Perception of sustainability by real estate investors

This section investigates to what extent investors already perceive sustainability-related concerns as an additional factor of obsolescence for their existing buildings. It first examines investors' perception of sustainability before analysing how they integrate sustainability-related topics into their investment and management practices. To do so, I use both a review of literature and interviews conducted by Novethic for an annual survey among French real estate managers. This survey was completed in 2011, 2012, 2013 and 2015. Its particularity is that it aims to cover the whole market and not only the leading market players. All asset managers with an agreement to manage regulated real estate funds were contacted[49]. Among them, a dozen each year had no active real estate funds, and were excluded from the survey. Remaining responses were collected using a questionnaire and phone interviews allowing for more in-depth details. Around 30 asset managers responded[50]. The sample of respondents is not exactly the same from one year to the next, but the evolution can be deemed representative since more than half of the respondents are the same in all publications.

## 3.1. From niche opportunity issues to risk management requirements

The analysis of publications before 2005 suggests that sustainable real estate remained a niche practice for several years. Discussing a series of three surveys conducted respectively in 1995, 1999 and 2005 on the perception of sustainability by property investors, Sayce *et al*. (2007) show that although awareness on sustainability-related topics was high as early as 1995, there were few impacts on market participants' behaviours. The authors conclude that in 2005, "*the tipping point in terms of sustainability being a transactional issues has not yet been reached*" (Sayce *et al.*, 2007, p.637). However, ten years later, sustainability no longer seems a niche but a mainstreaming issue (Nelson *et al.,* 2010; Novethic, 2011; Warren-Myers, 2012; RICS, 2013; UNEP FI, 2014b).

Several shifts in the context may explain the rise of sustainability concerns among real estate investors.

First and foremost, building owners must comply with more and more stringent regulations on sustainability-related topics (see **Appendix 1** for more details on French regulation). At building level, regulations are primarily focused on energy consumption. In the European Union, the two main legislations are the 2010 Energy Performance of Buildings Directive and the 2012 Energy Efficiency Directive[51]. Among others, they set mandatory disclosure of energy performance certificates (EPC) during rental and sale transactions, energy performance thresholds for new buildings and retrofits which should translate into all new buildings being nearly zero energy by 2020, and a renovation objective for the building stock. If the requirements for new buildings and retrofits are progressively being implemented in the national regulations, the renovation targets are yet to be set and implemented at the Member States level. In France, the 2007 Grenelle Act aimed a reduction of 38% of the energy consumption of the building stock by 2020. However, the enacting decree is still not

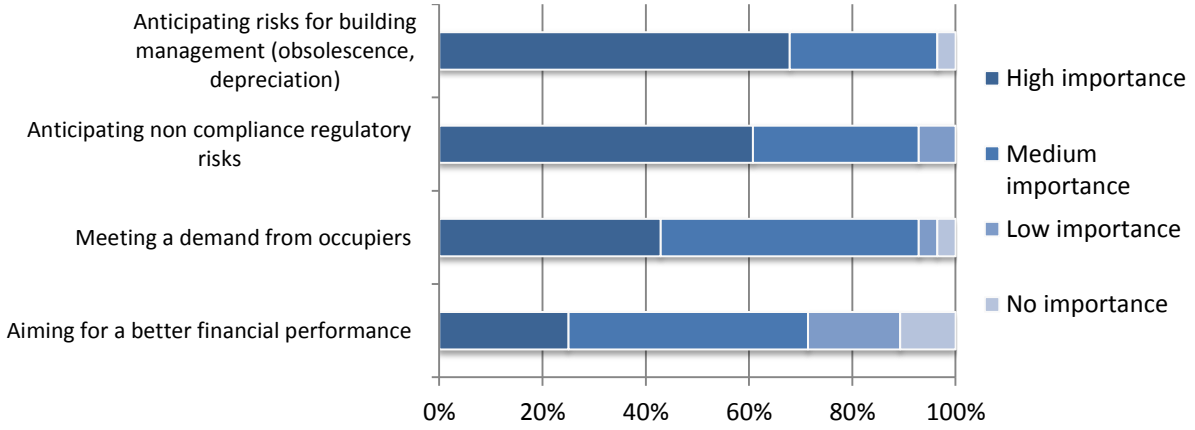
[49] The number of asset managers with an agreement from French public supervisor AMF for real estate management activities in the behalf of third parties increased from 42 in 2010 to 67 in the end of 2014.
[50] 22 respondents in 2011, 28 respondents in 2012, 33 respondents in 2013 and 2015.
[51] http://ec.europa.eu/energy/en/topics/energy-efficiency/buildings

published, leading to a climate of uncertainty for building owners and investors. Even though all the regulations are not yet being enforced, this rapidly shifting regulatory context is still a potent driver for investors to account for energy issues in their investment decisions.

Second, the rise of sustainability preoccupations among occupiers has translated into business opportunities and risks for building owners (Pivo, 2008). Sustainable buildings correspond to a demand from tenants who have included the occupation of sustainable premises as part of their own sustainability agenda. Large companies have indeed developed sustainability policies for their premises, associated with their Corporate Social Responsibility (CSR) policy and the mandatory disclosure of non-financial companies. For example, in France, under the article 225 of the Grenelle 2 Act, all listed or large companies are required to disclose information on their environmental, social and governance policies. To comply with this regulation, companies may be driven to develop sustainability policies, in particular on the premises they occupy.

Last, the integration of sustainability-related topics into real estate investment decision is also fostered by a more global trend on responsible investment. Initiated in listed equities, responsible investment corresponds to the integration of environmental, social and governance (ESG) issues into investment decisions. These practices have been promoted in the PRI (Principles for Responsible Investment), an international organization where asset owners and asset managers commit to integrate ESG criteria into their investment process and report on their practices. In real estate, this trend has given rise to Responsible Property Investment (Pivo and McNamara, 2005; Pivo, 2008; Roberts *et al.,* 2007). Responsible Property Investment can be defined as the "*efforts by property investors that go beyond compliance with minimum legal requirements to better manage the environmental, social and governance issues associated with property investing*" (Pivo, 2008, p.3). Large institutional investors are increasingly extending their responsible investment policy to their real estate portfolio. Simultaneously, a large number of real estate investment management companies have become signatories of the PRI (Larsen, 2010; Warren Myers, 2012; Novethic, 2013).

This context provides a strong call for investors to integrate sustainability criteria into their practices, and investors are now aware of the risks. According to Novethic's surveys (see **Figure 39**), main declared motives to engage in sustainable practices rest in the obsolescence and depreciation risks for buildings under management. The opportunity to create financial value ranks last. This result remained consistent over the different years.




**Question: According to you which are the main factors for the implementation of sustainability strategies?**

**Figure 39: Prevailing motives for the implementation of sustainability strategies (Novethic, 2012)**

These responses suggest that real estate investors have become aware of how the rise of sustainability preoccupations could impact their daily management of existing buildings. Sustainability no longer appears as a niche issue which integration could provide an additional opportunity on a niche market. It has evolved into a mainstream issue impacting the future financial performance of the existing building stock.

Professional bodies have taken act of these shifts. In its last edition, the RICS (2014) Red book requires valuers to collect sustainability-related data, assess sustainability performance, take account of impact on value, and make a statement on potential risks over time. Investors' organisations have also advised their members to deal with sustainability in their risk management practices. In particular, the investors group IIGCC (2013) recommends to investigate market changes associated with the rise of sustainability concerns and to address them in their investment and management practices.

## 3.2. Gradual integration of sustainability into investors' practices

On the whole, investors could employ two main types of approach to deal with sustainability concerns and their associated financial risks. On the one hand, they could deploy top-down strategies with the application of responsible investment principles to real estate. On the other hand, they could implement bottom-up approaches with sustainability emerging as a requirement to meet market's expectations (tenants and regulations in particular). Investigations of effective practices should help distinguish to what extent investors indeed act rather for fear of obsolescence rather than to apply ethical beliefs.

During the purchase stage, investors and asset managers increasingly integrate sustainability issues into their due diligences. In 2015 Novethic's survey, 56% of the respondents declare they systematically analyse the energy performance of buildings during their selection process against 36% in 2013. Sustainability performance is not necessarily a discriminating factor but the respondents declare they budget the capital expenses required to upgrade sustainability features for poorly performing buildings. Rather than disregarding buildings with poor sustainability performance, investors rather verify whether they will be able to retrofit them at reasonable costs. In 2015, 69% of the respondents to Novethic's survey mention they use sustainability assessments to identify and provision capital expenses for sustainability retrofits. Key topics considered mainly encompass energy consumption, environmental pollutants (such as asbestos and lead) and accessibility for disabled people. These different topics are already targeted by regulation.

During the holding period, investors and asset managers usually initiate a sustainability policy by undertaking mapping and monitoring of the energy performance of their buildings. **Figure 40** illustrates the rise of energy monitoring and mapping practices over the different surveys. This data collection serves different purposes: gain knowledge on the portfolio performance for disclosure and reporting purposes, identify potential risks for future regulatory compliance and determine levers to improve sustainability performance. Yet, their improvement of the energy performance is seldom part of a structured policy and performance targets remain scarce. In addition, energy is only one topic of sustainability. Overall, sustainability practices are focused on energy efficiency, and correspond rather to case by case measures according to upgrade opportunities offered by deep

refurbishments and occupiers departure. Certification schemes (either renovation or in-use labels) are increasingly used to showcase these sustainability upgrades as long as large premises are concerned. For several players, certified assets are now exceeding a third of total portfolio under management.

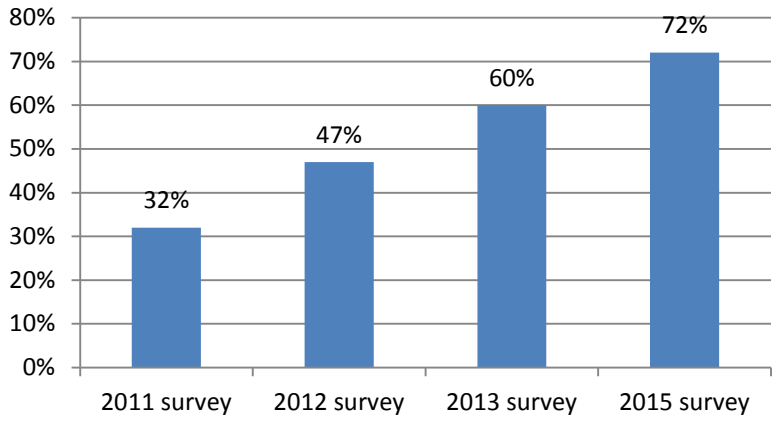



**Figure 40: Share of the sample declaring having undertaken energy performance mapping or monitoring in Novethic's surveys (elaborated using Novethic publications)**

Simultaneously, more and more market players commit to responsible investment practices. As illustrated in **Figure 41,** the share of respondents having formalised a responsible policy for their real estate activities have been steadily increasing up to 53% in the 2015 survey. This policy can take different names and shapes: ESG policy, Responsible Investment policy, CSR charter, etc. In these documents, investors commit to integrate environmental, social and less frequently governance issues into their practices. However, these commitments are not always translated into dedicated organisation. Leading practices consist in the elaboration and deployment of multi-criteria matrices to assess new investments and monitor buildings in portfolios. In 2015, 35% of the respondents mentioned using such tools against 30% in 2013. Topics concerned by these matrices mostly encompass energy, water, waste, public transportation, health, comfort and accessibility. These topics usually correspond to issues covered by regulation (existing or anticipated) as well as issues perceived as important for occupiers. Consequently, these responsible policies can also be analysed as responses to a shifting context.

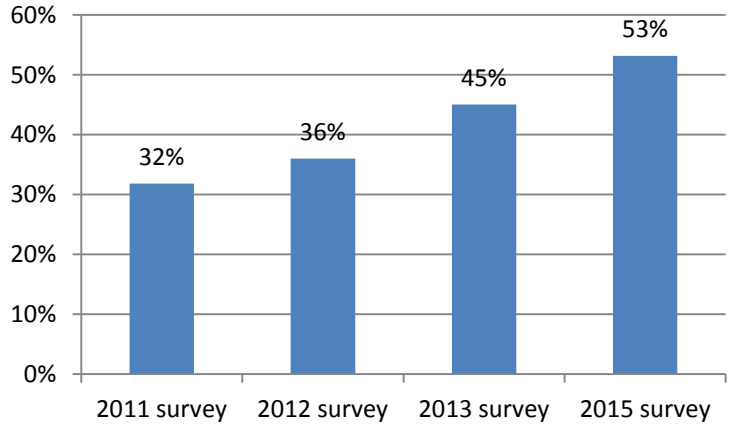



**Figure 41: Share of the sample declaring having formalized a responsible property investment in Novethic's surveys (elaborated using Novethic publications)**

The analysis of the French players suggests that sustainable practices are indeed mainstreaming. However, these practices do not always exceed existing or anticipated regulations or topics deemed as having an impact on marketability and value. In particular, topics examined seldom exceed topics targeted by regulation (energy, environmental pollutants, accessibility for the disabled) and by certification schemes. These conclusions coincide with previous results from other countries. Large area of so-called sustainability and responsible investment practices correspond to compliance and anticipation of regulatory frameworks (Warren-Myers, 2012). These results confirm that investors have increasingly perceived sustainability concerns as a factor of obsolescence for their existing buildings and have started to act on this perception, but usually fail to be more proactive.

# 4. Integration of sustainability into the management of the building stock

This section examines further how investors tackle the potential obsolescence associated with sustainability concerns for their existing buildings. First, I consider how obsolescence in general is treated before discussing specific aspects associated with sustainability. To do so, I review the types of tools used by asset managers, investors and their service providers to deal with the sustainability performance of the building stock and its associated financial risks. A list (non exhaustive) of such projects/tools is presented in **Appendix 2**.

## 4.1. General treatment of obsolescence

For existing buildings, obsolescence must be first identified before remediation measures can be taken. Different approaches to identify obsolescence can be found in the literature, including economic assessments, examination of retrofits feasibility, and building quality appraisals. Economic assessments rely on the identification of high long term vacancy and low rental levels (Baum, 1993). The examination of retrofits feasibility corresponds to the analysis of the conditions conducive to retrofits and refurbishments (Kohler and Hassler, 2002). The underlying principle consists in identifying types of building that will be difficult to upgrade. Building quality appraisals aim to determine to what extent building features match expectations. The appraisal may rest on expertise from professionals[52] or on questionnaires to collect occupiers' assessments (Bottom *et al.*, 1999). Another approach based on building examination consists in investigating the works completed along the buildings life cycle, as suggested by Thomsen and van der Flier (2011). In practice, identifying obsolescence is usually not straightforward. In particular, investors may not act rationally and may fail to notice emerging issues. In particular, Brown and Teernstra (2008) show that investors tend to be over optimistic as regards the quality of their assets and to overlook obsolescence factors.

[52] Examples of software include ORBIT 2.1, Serviceability4, BQA, IBE (Bottom *et al.*, 1999), the Tobus Sofware (Allehaux and Tessier, 2002); Langston (2011), the CIBE rating, etc.

After identification, several solutions exist to counter obsolescence. First, minor repairs can help fight against physical deterioration, but have limited effects on obsolescence. To tackle obsolescence, retrofit and refurbishment works can be used to upgrade building quality and bring the building back to current expectations. In this context, retrofits should be distinguished from refurbishments. In particular, Dixon (2014) distinguishes between "*light-touch retrofits*" and "*deep refurbishments*", the latter usually involving "*envelope upgrades, replacement and reconfiguration of HVAC and heating/cooling systems, better control systems and lighting improvements" and mainly"* (Dixon, 2014, p.446). Another solution dwells in adapting the building to other uses (e.g. transform office buildings into housing units).

Last but not least, measures may be taken to prevent obsolescence at the conception stage (for new buildings or retrofits). The underlying idea is to integrate resilient features and flexible/adaptable systems and layouts into the building design. Different related concepts should be distinguished. Resilience corresponds to "*the capacity to bounce back after a disturbance or interruption*"[53]. It refers to punctual shocks, with the context returning back to its normal state. By contrast future-proofness concerns modifications that are permanent and evolve over time. The emphasis is put on risk mitigation in face of an uncertain future (Georgiadou *et al.,* 2012). Adaptability also refers to permanent evolutions of the context but considers how well buildings will behave faced to these evolutions (Wilkinson, 2014). In this chapter, I use resilience to refer to how buildings withstand shocks, future-proofness to refer to what extent buildings can withstand future changes by integrating future scenarios as early as possible, and adaptability to refer to the capacity of buildings to be modified easily to accommodate new requirements.

**Figure 42** illustrates the different pathways exposed previously to tackle obsolescence. For existing buildings, the identification of obsolescence factors is a prerequisite to their treatment through retrofits and refurbishments. For new developments and refurbishments, understanding the mechanisms at stake enable investors to adapt their design and prevent obsolescence on the long term. Ideally, the mechanisms identified for the existing stock should inform decisions for new developments and refurbishments. Conversely, measures to treat obsolescence for existing buildings should account for means to prevent obsolescence on a longer term.

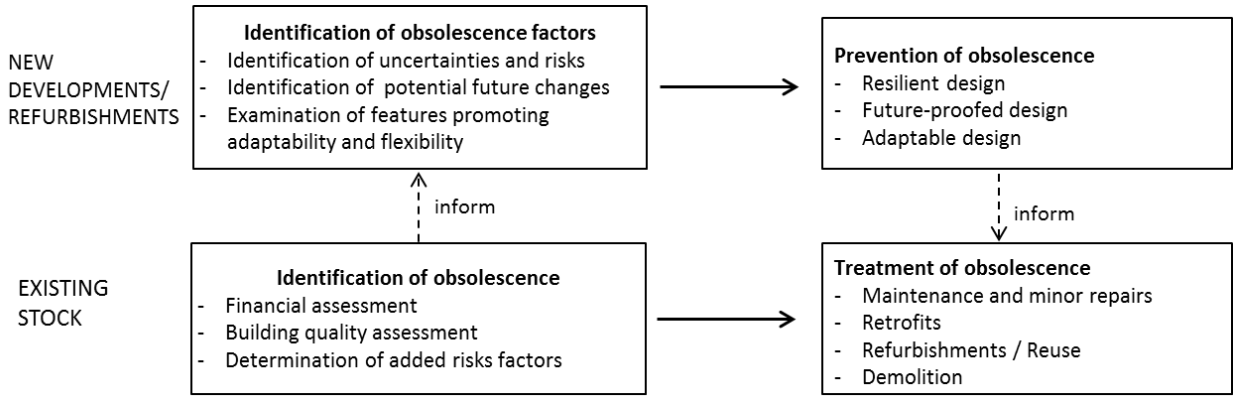



**Figure 42: Treatment of obsolescence**

For the most part, the review of investors' practices and tools (see **Appendix 2**) used to tackle and manage sustainability-related concerns suggests that sustainability-related obsolescence meets the

[53] http://www.resilientdesign.org/

pathways presented in **Figure 42**. The following sub-sections investigate first how sustainability-related obsolescence is identified (4.2), then how it is currently tackled (4.3). Last, it examines if steps are taken to prevent longer term obsolescence in refurbishment decisions (4.4).

## 4.2. Identification of sustainability-related obsolescence

The identification of sustainability-related obsolescence starts with an assessment of the sustainability performance. Different approaches exist according to the final objective of the tool reviewed: elaboration of a strategy at a portfolio level or retrofit/refurbishment solutions for a given building.

At portfolio level, the assessment is performed using comprehensive assessments or simplified mappings. The investors surveyed tend to rather start with simplified mapping to swiftly gain a general understanding of their portfolio. They point out several issues to process the data collected. First, raw data are usually not homogeneous across their portfolio. Investors may own buildings located in different countries with different regulations and different sustainability assessment schemes. Second, according to local conditions, same environmental metrics may not correspond to same levels of performance. For example, a same level of energy consumption for two buildings located in two different climate zones will not correspond to the same level of performance. Last the intensity of use may not be the same between various buildings and may prevent the direct comparison of raw indicators. To address these issues, service providers have developed simplified assessment tools, aimed at comparisons across and between portfolios, such as IPD EcoPAS, CarbonScreen® or Green Rating™.

Interventions only on specific buildings are usually motivated by vacancy and/or tenants' departure. The performance assessment mostly rests on similar information from one tool to the next. The topics considered usually encompass location and connectivity, environmental performance, quality of the workplace, indoor environmental quality and comfort. The data are collected through audits and site visits, and are used to identify the strengths and weaknesses of the building considered. This assessment is sometimes used to rate the building, with a scoring which may be similar for all buildings assessed, or which may depend on the specific building context (type of market and type of occupiers in particular). For an example in this second category, see in particular Nexity Attractiveness Index. This tool aims to account for varying expectations on workplace organisation and sustainability performance from one occupier to the next.

This examination of sustainability-related features is usually not deemed sufficient to identify factors of obsolescence. Different buildings with a same poor level of sustainability performance will not be exposed to the same risk of depreciation. Existing assets in competition with sustainable buildings are more likely to be affected financially. Several service providers have thus also proposed market analyses to identify potential financial risks raised by poor sustainability performance. For example, in its tool Regeneration Durable®, JLL distinguishes different market zones with different potential financial impacts for sustainability-related features. The Sustainable Property Appraisal Project uses a "*Future Proofing Property Questionnaire*" to link sustainability-related criteria to investment appraisals (Sayce *et al*., 2007; Ellison and Sayce, 2007).The investors themselves assess the risks raised by poor sustainability performance according to the specific context of the building being

analysed. For climate change issues, the Climate Risk Toolkit (CRT) launched by the RICS proposes a review of potential risks associated with climate change regulation (existing or potential).

Last but not least, the examination of legal and financial retrofit/refurbishment conditions is also considered. The underlying principle is that buildings which are difficult to retrofit will tend to become more obsolete than others. At building level, the characteristics of tenants and owners represent simple information to determine potential levers for action. They appear among the first considerations for DeltaGreen, for example. This approach has also been used for rough appraisals in statistical studies. For instance, the regional real estate observatory ORIE (2012) used a grid consisting in three topics (type of owners and occupants, key building characteristics and accessibility) to identify the buildings best equipped to withstand obsolescence.

It is interesting to note that although all tools reviewed tackle the financial risks associated with poor sustainability performance, few of them (e.g. Regeneration Durable® by JLL, Revivalis by Kaufman & Broad, Attractiveness Index by Nexity) explicitly mention obsolescence. Most tools rather refer to value creation. This may be explained by the over optimistic tendency of investors who tend to underestimate obsolescence risks, as highlighted by Brown and Teernstra (2008). However, as a consequence, most tools reviewed focus on short term risks and seem to fail to properly address the dynamic aspects of obsolescence. They have difficulty accounting for the impacts of emerging trends. In addition, they are usually limited to a small number of topics, which may prevent a holistic examination of building quality, and hence of the various factors of obsolescence.

## 4.3. Treatment of sustainability-related obsolescence

### *Elaboration of strategies*

Following the identification stage, two types of pathways are undertaken. First, investors seek sustainability improvement strategies that can be completed in the presence of tenants (see for example BBP Low Carbon Retrofits approach). This leads to minor low-cost measures (referred to as "*quick wins*" by (UNEP FI 2014a)) that can be conducted even if the premises are occupied. Then, investors seek deeper refurbishment solutions for their vacant premises (see for example RehaGreen® Approach).

Minor measures that can be completed within occupied premises can be framed through portfolio wide strategy. They encompass meters (to monitor more closely environmental performance, raise awareness among users and enable facility managers to detect abnormal situations), low consumption lighting and the replacement of technical installations at the end of their operating life. Expenses to complete these strategies are usually spread over time according to multi-year plans for maintenance and minor repairs. An example of such strategy is examined by Kamelgarn and Hovorka (2013).

Major sustainability upgrades are usually decided on a more punctual basis. Interviewed for Novethic's survey, several asset managers explain that sustainability is rarely the main driver of retrofit and refurbishment decisions. Building vacancy, specific demand from occupiers, multi-year plans for major repairs and investments are presented as the prevailing motives. Retrofit and refurbishment works, which occur over regular cycles (approximately ten years for HVAC systems

retrofits, and 20 to 30 years for deeper refurbishments[54]), afford opportunities to improve the sustainability performance of buildings. At the least, there will thus be fortuitous sustainability improvements (due to technology upgrades and more stringent regulation on technical installations and retrofits) at these occasions. In addition, when sustainability is deemed paramount for the asset marketability, deeper sustainability upgrades are considered, with if possible labels and/or certification schemes to provide evidence on the sustainability upgrade. Evidence on the French market is consistent with Australian results from (Wilkinson, 2012; 2014).

All buildings are thus not equally treated. The types of strategy adopted (minor improvements versus deep refurbishments) will depend not only on the sustainability performance of the building considered but also on the type of tenants, the type of lease, the type of ownership, the capital constraint of the owner, etc. Deep refurbishments mainly concern buildings where sustainability upgrades are perceived as important for the marketability of the building. This tends to discriminate between two types of buildings: buildings in prime locations where sustainability is valued by occupiers, which will tend to be upgraded, buildings in other locations, which may undergo minor sustainability improvements but no deeper upgrade. This could potentially reinforce the gap in the long term value of these two types of assets.

### *Financial ratios used for sustainability upgrade decision-making*

Costs calculations and payback ratios appear as the most mentioned ratios to compare retrofit scenarios. Along these lines, decisions rest on a trade-off between upgrade costs and utilities expense savings (energy, water, waste). Another simple financial indicator mentioned is the ratio between upgrade costs and asset value. It justifies that larger amount can be spent for buildings with higher value, typically for high services buildings in prime locations. However, these decision ratios have been disputed as relying on a narrow view of the benefits associated with sustainability upgrades. These costs assessments only account for benefits in terms of utility costs whereas other benefits such as image, comfort and health have also been highlighted[55]. In particular, UNEP FI recommends that investors "*enlarge the business case beyond the energy efficiency project assessment level by accounting for impact on the financial performance of the investment.*" (UNEP FI, 2014a, p.7). Simultaneously, projects (e.g. as immaterial value assessment by Goodwill Management or added use value appraisal by Quartier Libre, see **Chapter 1**) have recently emerged for the assessment of benefits for occupiers (image, organisation efficiency, productivity gains).

In addition, the impact of sustainability upgrades on asset financial value is increasingly accounted for. In the 2015 Novethic's survey, 58% of the sample declares they account for the impact of sustainability-related features (mostly energy) on financial value during their investment decisions. Similarly, several tools from service providers focus on value appraisals to compare scenarios, such as RehaGreen® and Regeneration Durable®. However, during interviews, situations appear more complex. Investors and analysts globally reckon that sustainability features impact the value of buildings, but have difficulty precisely integrating them into their financial ratios. In their value appraisals of refurbished buildings, they rely on past transactions and short term occupancy

[54] ADEME (2012) *Les enseignements de la cartographie énergétique d'un parc tertiaire*. Study completed in partnership with Sinteo and La Française AM.

[55] See for example World GBC (2013) *The Business Case for Green Building. A Review of the Costs and Benefits for Developers, Investors and Occupants.* Accessible online at: http://www.worldgbc.org/activities/business-case/

perspectives. They mostly account for market repositioning (i.e. high quality building versus low quality) rather than the added value of the sustainability-related features themselves.

The focus on costs calculations and short term financial value tends to limit the ambitions of the sustainability upgrades (aiming first for "quick win"). It also tends to reinforce the undertaking of sustainability upgrades in locations where a large number of sustainable buildings already exists, and limit them in other locations. On the whole, current practices seem to be rather focused on short term "quick return" solutions rather than long term management of asset value.

## 4.4. Prevention of sustainability-related obsolescence

However, several investors and advisors point out that rapidly shifting regulations and certification schemes tend to make new buildings and retrofits already obsolete after just a few years. To prevent this accelerated obsolescence, accounting for potential future changes into the design stage (new developments and refurbishments) seems paramount to "future-proof" the buildings to shifting requirements. As regards energy performance requirements, Georgiadou *et al.* (2012) thus define future-proofed energy designs as "*design processes that accommodate explicitly full life cycle perspectives, risks and uncertainties*" (Georgiadou *et al., 2012,* p.146).

In the tools reviewed, the integration of future scenarios is only partial. As regards environmental regulations and standards, most tools examine current and pending regulations, as well as existing certification schemes. On environmental criteria, quick wins are thus favoured to meet only minimal requirements. The highest levels of ambition are only sought for if they respond to occupiers' demand in competitive markets. However, the context is rapidly shifting and some projects have also recommended examining future potential regulations (see for example the Climate Risk Toolkit developed on behalf of the RICS). As regards occupiers' expectations, several advisors mention research on the evolution of workplaces due to the new ways of working. This may lead them to specialise their premises according to specific current occupiers' requirements, without care for the occupiers that will follow.

Processes thus focus mainly on immediate occupancy (current occupiers or prospective occupiers for vacant spaces) and short term context. As a consequence, decisions are one-shot. They anticipate the next move but not beyond. Solutions thus chosen may prove to be less optimal than if a longer time horizon were examined. In particular, they may "lock-in" deeper retrofit opportunities. For example, installing a more efficient boiler will certainly improve the overall energy consumption but will probably delay the undertaking of building envelope improvements. Similarly, an insulation work of low ambition will prevent an insulation of deeper ambition, whereas the opportunity to retrofit will only arise again after fifteen years or so, for the next refurbishment. More globally, neglecting to fully take advantage of current refurbishment opportunities for large sustainability upgrades will delay next opportunities for sustainability upgrades. It will thus increase the potential rate of obsolescence of retrofitted buildings in a context of rapidly shifting context on sustainability-related concerns.

To summarise, the treatment of sustainability-related obsolescence still more corresponds to one-shot improvement measures than to global strategies for the management of obsolescence risks. These approaches may create irreversibility which could hinder the improvement of the existing stock on the long run.

# 5. Towards a dynamic modelling of sustainability-related obsolescence

To explore the impacts of this short-term focus, this section proposes a simplified dynamic framework to account for the drivers of sustainability upgrades in refurbishments considering the whole building life cycles. I suggest modelling obsolescence using infinite refurbishment sequences to investigate how neglecting the impact of obsolescence impacts the refurbishment decision process. This section first presents the general framework, before discussing and comparing models with and without obsolescence.

## 5.1. General framework

Based on the description of obsolescence discussed in **Section 2**, I consider infinite sequences of retrofit and refurbishment. I postulate that sustainability expectations are increasing over time, due to more stringent regulations, as well as technical and social changes. Conversely, building quality is decreasing under the combination of two effects: physical deterioration and growing inadequacies with the demand.

Maintenance and minor repairs are used to counter physical deterioration. They correspond to management operations and minor repairs to maintain the building in condition. However, there are not sufficient to counter obsolescence associated with sustainability-related concerns, since they do not improve building quality. Deeper refurbishments with sustainability improvements are required. They include larger interventions to upgrade building envelope and technical installations. They are planned between longer time intervals. Hence the retrofits and refurbishments cycles illustrated in **Figure 43.**

The key features of this simplified model are as follows:

- Without intervention, the perception of the quality of a building decreases over time under the combined effect of its physical deterioration and the rise of users‘ expectations (obsolescence).
- The rate of physical deterioration is function of the building quality and its management (maintenance and minor repairs).
- Repairs and light retrofit works enable investors to fight against physical deterioration while slightly upgrading sustainability features, however their action on functional obsolescence is only partial.
- Refurbishment works are the only solution to bring back the building to occupiers‘ expectations. They occur at regular intervals over the building life cycle.

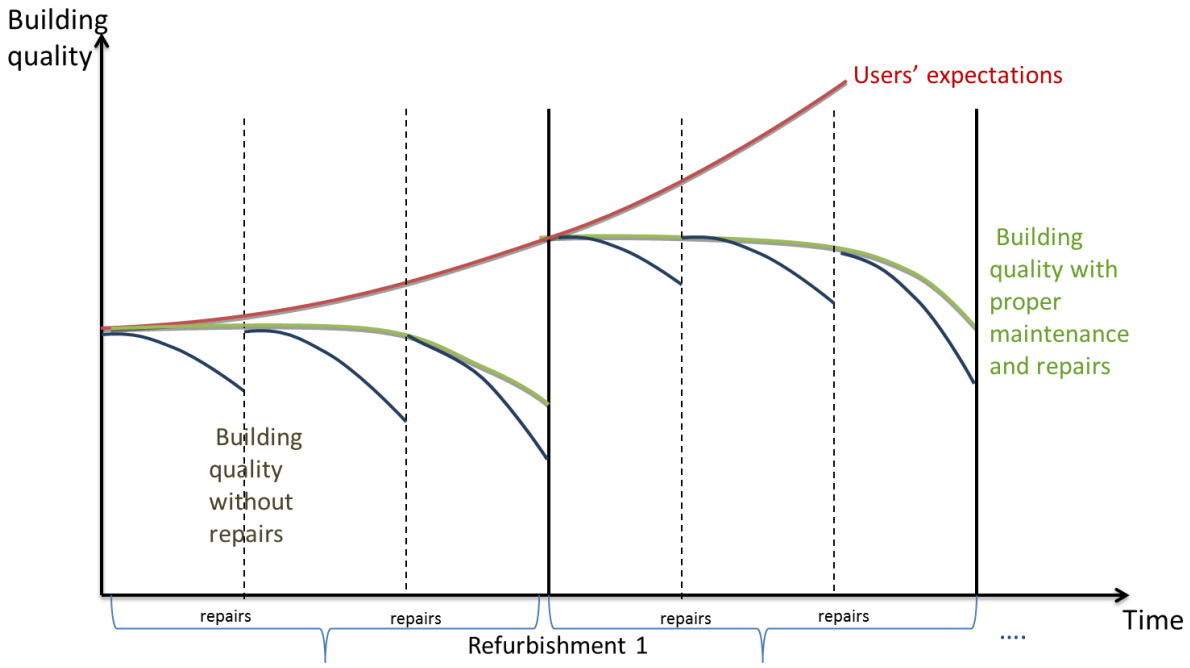



**Figure 43: Simplified model for retrofit and refurbishment cycles**

Infinite sequences for stock management are not a new problem. In forest economics, infinite rotation sequences are used to determine optimal crop harvesting. The Faustmann model, developed in 1849 and widely used since then, relies on discounted cash flows in infinite sequences (Hartman, 1976). Forestry management is described as an infinite sequence of crop rotation, with regular thinning to ensure proper growth and a final harvest (e.g. timber cut) at the end of each period. I draw on this approach to propose a modelling of buildings retrofit and refurbishment through infinite sequences. Minor repairs and renovations are analysed as forest thinning whereas refurbishments are analysed as timber harvesting. By contrast with forest economics, revenues are spread out over the whole period under the form of rental revenues.

## 5.2. Refurbishment cycles in the absence of obsolescence

Using a discrete modelling, expenses and rental levels respectively increase and decrease over time during one sequence of refurbishment but globally remain constant (except for inflation effect) from one refurbishment sequence to the next, as illustrated in **Figure 44**. Expenses for maintenance and minor retrofits are noted $M_k$ (k=1...N-1) whereas rental levels are noted $R_k$ (k=1...N-1). Retrofit costs are noted C, they occur at the beginning of a sequence of duration N and are similar between one sequence and the next. In addition, all these parameters vary with the level of sustainability performance α : investment cost increases with the level of sustainability performance sought, leading to smaller expenses $M_k$ and larger rental revenues $R_k$.

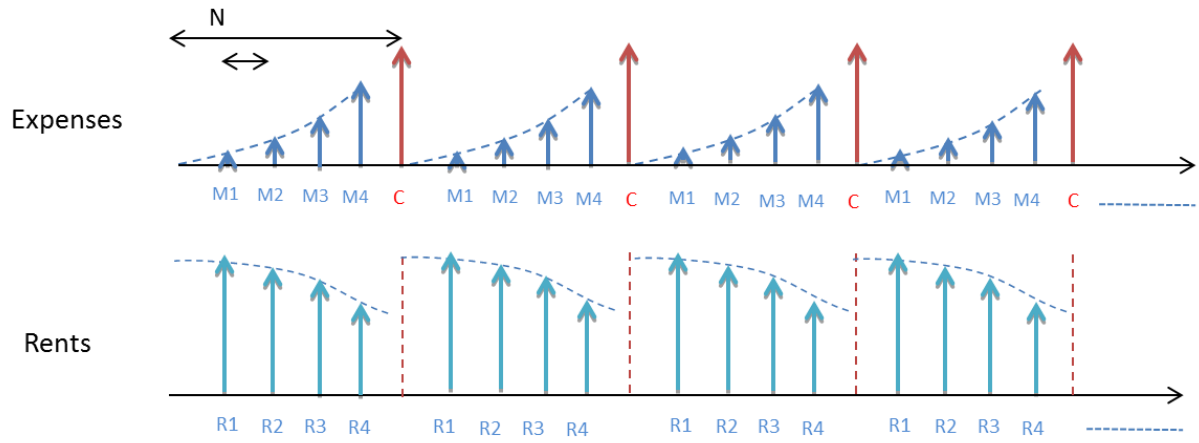



**Figure 44**: **Expenses and rental levels without obsolescence (stylised model illustration for N=4 )**

The discounted cash flow in infinite sequence is thus:

$NPV_\infty(N, \alpha) = \sum_{j=0}^{\infty}(\sum_{k=1}^{N-1}(R_k - M_k)e^{-rkt} - C)\, e^{-jrNt}$

$NPV_\infty(N, \alpha) = (\sum_{k=1}^{N-1}(R_k - M_k)e^{-rkt} - C)\frac{1}{1-e^{-rNt}}$

Noting R-M $=\sum_{k=1}^{N-1}(R_k - M_k)e^{-rkt}$ the net cash flows for a sequence, discounted at the beginning of the sequence, this formula simplifies as follows:

$$\mathbf{NPV_\infty}(N, \alpha) = (\boldsymbol{R}(N, \alpha) - \boldsymbol{M}(N, \alpha) - \boldsymbol{C}(N, \alpha))\frac{\mathbf{1}}{\mathbf{1-e^{-rNt}}}$$

This expression corresponds to the cash flow over one sequence discounted at the rate $e^{-rNt}$ taking into account not only the initial discount rate but also the duration of a sequence.

This expression can be used to calculate the optimal sustainability level:

$$\frac{dNPV_\infty}{d\alpha} = 0 \Leftrightarrow \frac{dR}{d\alpha} - \frac{dM}{d\alpha} = \frac{dC}{d\alpha}$$

The optimal sustainability level α* only depends on the cash flow associated with one sequence. It results from the trade-off between increasing investment costs to improve sustainability ($\frac{dC}{d\alpha}$) and improving net rental revenues ($\frac{dR}{d\alpha} - \frac{dM}{d\alpha}$).

Similarly, **$NPV_\infty$** expression can be used to calculate the optimal duration between two refurbishment works:

$$\frac{dNPV_\infty}{dN} = 0 \Leftrightarrow \left(\frac{dR}{dN} - \frac{dM}{dN} - \frac{dC}{dN}\right)\frac{1}{1-e^{-rNt}} + (R - M - C)\frac{-rte^{-rNt}}{(1-e^{-rNt})^2} = 0$$

$$\Leftrightarrow \underbrace{\frac{dR}{dN} - \frac{dM}{dN}}_{A} = \underbrace{rtNPV_\infty e^{-rNt} + \frac{dC}{dN}}_{B}$$

A : Marginal revenues for waiting an additional year before refurbishing

B : Marginal costs for waiting an additional year before refurbishing

The optimal duration between two refurbishments N* verifies the equality between:

- The marginal revenues (A) for waiting an additional year before refurbishing which corresponds to the sum of the net rental revenues perceived during this additional year ($\frac{dR}{dN} - \frac{dM}{dN}$ ).
- The marginal costs (B) for waiting an additional year before refurbishing which corresponds to the sum of the decrease of future asset value ($rtNPV_\infty \approx NPV_\infty - NPV_\infty e^{-rt}$) and the increase in the investment required due to postponing the refurbishment for one additional year.

The optimal duration between two refurbishment decisions thus relies not only on the cash flow associated with one sequence but also depends on the postponing of the remaining investment sequences.

When obsolescence is not accounted, the optimal sustainability level only depends on the cash flow associated with one sequence. In this regard, neglecting to account for the whole building refurbishment cycle is thus not misleading. However, the optimal duration between two refurbishment decisions depends on the full infinite sequence. Neglecting to account for the whole refurbishment cycles can thus lead to delay too long refurbishment decision (and thus sustainability upgrade).

## 5.3. Refurbishment cycles in the presence of obsolescence

In the presence of obsolescence, the previous situation is modified as follows. Due to the rise of occupiers' expectations and the increasing mismatch with services provided by buildings. Rental revenues $R_k$ and minor expenses $M_k$ respectively decrease and increase more rapidly from one sequence to the next. Higher refurbishment costs $C_j$ (j=1…∞) are thus required to counter these trends. Refurbishment costs are no longer constant but increase along the refurbishment cycles. **Figure 45** illustrates these assumptions on expenses and rental revenues:

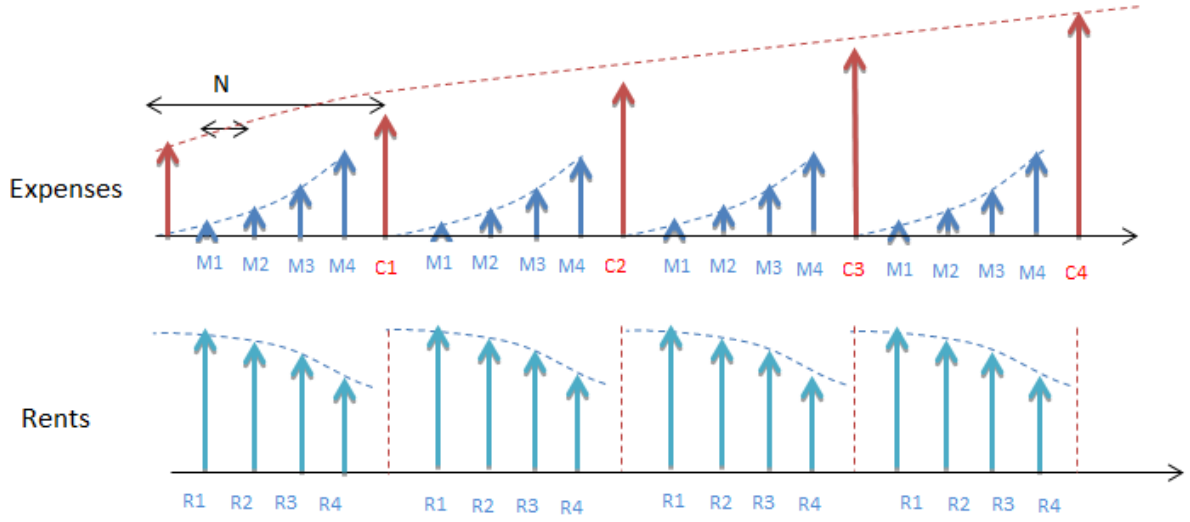



**Figure 45: Expenses and rental levels in the presence of obsolescence (stylised model illustration for N=4 )**

For simplicity purposes, I suppose that the impact of obsolescence unfolds from one sequence j to the next. :

Noting $M_j(N,\alpha)$ the discounted maintenance and minor repairs costs (discounted at the beginning of a cycle) for sequence j:

$M_j(N,\alpha) = \sum_{k=1}^{N-1} M_{jk} e^{-rkt} = M(N,\alpha)(1+f_M(j,N,\alpha))$

Noting $R_j(N,\alpha)$ the discounted rental revenues (discounted at the beginning of a cycle) for sequence j:

$R_j(N,\alpha) = \sum_{k=1}^{N-1} R_{jk} e^{-rkt} = R(N,\alpha)(1- f_R(j,N,\alpha))$

Noting $C_j(N,\alpha)$ the discounted rental revenues for sequence j:

$C_j(N,\alpha)= C(N,\alpha)(1+ f_C(j,N,\alpha))$

The discounted cash flow in infinite sequence is thus:

$$NPV_\infty = \sum_{j=0}^{\infty}\left( R(N,\alpha)(1 - f_R(j,N,\alpha)) - M(N,\alpha)(1 + f_M(j,N,\alpha)) - C(N,\alpha)\left(1 + f_C(j,N,\alpha)\right)\right) e^{-jrNt}$$

$$NPV_\infty = \left(R(N,\alpha) - M(N,\alpha) - C(N,\alpha)\right)\sum_{j=0}^{\infty} e^{-jrNt} - \sum_{j=0}^{\infty}\left( R(N,\alpha) f_R(j,N,\alpha) + M(N,\alpha) f_M(j,N,\alpha) + C(N,\alpha) f_C(j,N,\alpha)\right) e^{-jrNt}$$

$$\mathbf{NPV_\infty} = \underbrace{\left(\boldsymbol{R}(N,\alpha) - \boldsymbol{M}(N,\alpha) - \boldsymbol{C}(N,\alpha)\right)\frac{1}{1-e^{-rNt}}}_{\text{NPV}_\infty \text{ without obsolescence}} - \underbrace{\boldsymbol{F_{irrev}}(\boldsymbol{N},\alpha)}_{\text{Irreversible losses due to obsolescence}}$$

The discounted value in the presence of obsolescence is similar to the value in the absence of obsolescence, but with an irreversible value loss due to the increasing quality expectations.

This expression can be used to calculate the optimal sustainability level.

$$\frac{dNPV_\infty}{d\alpha} = 0 \Leftrightarrow \left(\frac{dR}{d\alpha} - \frac{dM}{d\alpha} - \frac{dC}{d\alpha}\right)\frac{1}{1-e^{-rNt}} - \frac{dF}{d\alpha} = 0$$

$$\Leftrightarrow \frac{dR}{d\alpha} - \frac{dM}{d\alpha} - \frac{dF}{d\alpha}(1 - e^{-rNt}) = \frac{dC}{d\alpha}$$

In the presence of obsolescence, the optimal sustainability level α* results not only from the trade-off between increasing investment costs to improve sustainability ($\frac{dC}{d\alpha}$) and improving net rental revenues ($\frac{dR}{d\alpha} - \frac{dM}{d\alpha}$) but also from the reduction in the future losses associated with obsolescence ($\frac{dF}{d\alpha}(1 - e^{-rNt})$). The optimal sustainability level α* is thus higher than when obsolescence was not accounted for, and can no longer be determined examining only one refurbishment sequence. It also requires examining future trends.

Similarly, **$NPV_\infty$** expression can also be used to calculate the optimal duration between two refurbishment works.

$$\frac{dNPV_\infty}{dN} = 0 \Leftrightarrow \left(\frac{dR}{dN} - \frac{dM}{dN} - \frac{dC}{dN}\right)\frac{1}{1-e^{-rNt}} + (R - M - C)\frac{-rte^{-rNt}}{(1-e^{-rNt})^2} + \frac{dF_{irrev}}{dN} = 0$$

$$\Leftrightarrow \underbrace{\frac{dR}{dN} - \frac{dM}{dN}}_{A} = \underbrace{\frac{dC}{dN}}_{B} + \underbrace{rt(R - M - C)\frac{e^{-rNt}}{1-e^{-rNt}}}_{C} - \underbrace{\frac{dF_{irrev}}{dN}}_{D}$$

At the optimal duration between two refurbishments, there is equality between the marginal benefits from postponing refurbishments associated with the rise of net revenues over one sequence (A) in the one hand, and the rise in investment costs (B), the rise in irreversible losses due to the lengthening of a sequence (D) as well as the marginal costs for waiting (C) resulting from the decrease in future asset value ($rtV \approx V - V\,e^{-rt}$) discounted at the infinite rate $e^{-rNt}$.

In the situation with obsolescence, there are further incentives not to wait for one more period to refurbish, resulting from the presence of irreversible losses due to waiting. Consequently, not accounting for obsolescence delays the refurbishment.

### 5.4. Limits of the model

This model assumes that retrofits and refurbishments occur at regular intervals that do not vary over time and may be predicted by the owners. If this assumption is very realistic in forestry management, it is farther from reality for real estate. In particular, the length of refurbishment cycles will depend on lease durations that result from occupiers' decisions. In addition, the level of sustainability required from on period to the next will vary according to market and occupiers' shifting expectations.

A solution would be to sophisticate this model further by accounting for the uncertainty associated with lease duration, refurbishments costs and the impact of sustainability on rental revenues. However, this should not change the underlying principles highlighted. Obsolescence generates additional irreversible losses that should be examined considering the whole building life cycle (and the multiple refurbishment sequences) and not only a single sequence of maintenance and rental revenues.

## 6. Conclusion and perspectives for further research

This article contributes to fill the literature gap on the impact of sustainability-related concerns on the building existing stock. Analysing sustainability through an obsolescence angle enables to investigate the long term impact of sustainability-related concerns, and its consequences not only for the new developments but also for the existing building stock.

First, it highlights the extent to which sustainability-related topics are indeed new factors of obsolescence tackled by investors through retrofits and deep refurbishments. However, it notes that investors fail to properly address the value of sustainability upgrades and neglect to account for the dynamic aspects of sustainability-related trends. They tend to consider sustainability upgrades as one shot events rather than parts of refurbishment cycles occurring over the whole building lifespans.

Second, it presents a stylized theoretical model to illustrate the impact of dynamic trends across infinite cycle of refurbishment works. This modelling highlights that neglecting to account for obsolescence tends to postpone investment for refurbishment and reduce the ambition of

sustainability upgrade. This modelling is simple and not readily applicable for investment decision process. However, it could provide interesting pathways to explore to elaborate a more complex investment framework.

In order to better take account of sustainability-related obsolescence in investment decision process, I thus suggest the steps presented in **Figure 46.**


**Figure 46: Stages for a dynamic modelling of sustainability-related obsolescence**

Further research on refurbishment sequences using life cycle perspectives could help better comprehend how sustainability improvements unfold over time. Perspectives for research are two-folds: better modeling refurbishment cycles and improving data collection necessary to feed these refurbishment sequences modelling. In this respect, research on building information modelling and its consequences for life cycle costing could prove interesting. At a later stage, this modelling could be sophisticated further with improved accounting of future trends, in particular as regards occupiers' expectations.

In addition, further research on the identification of the potential impact on rental revenues is required. This would for example involve investigating the various occupiers' behaviours in the different market segments. In addition, matching models could also be attempted to highlight that sustainability upgrades are not likely to be appraised similarly according to the market segments. Research on intangible values for occupiers could also prove interesting to understand additional marketability associate with sustainability-related features. Last, further research is also required to account for the uncertainty associated with the previous modelling.

On a more global level, this article raises the issue of the description of real estate. In order to limit vacancy and attract high grade occupiers, investors are increasingly tempted to strongly adapt their buildings to the specific requirements of building occupiers. However, this specialisation corresponds to one-shot decisions that do not account for building management on the longer run. One can wonder whether this specialisation is sustainable. Two approaches could be distinguished. On the one hand, existing buildings can be considered as a stock similar to standing forests. In this context, long term perspective is paramount to ensure efficient management. On the other hand, existing buildings could be considered as specialised products, such as logistic warehouses which are quickly built with low cost materials, and immediately reconstructed when needs change. In this context, high specialisation may represent an efficient management path.

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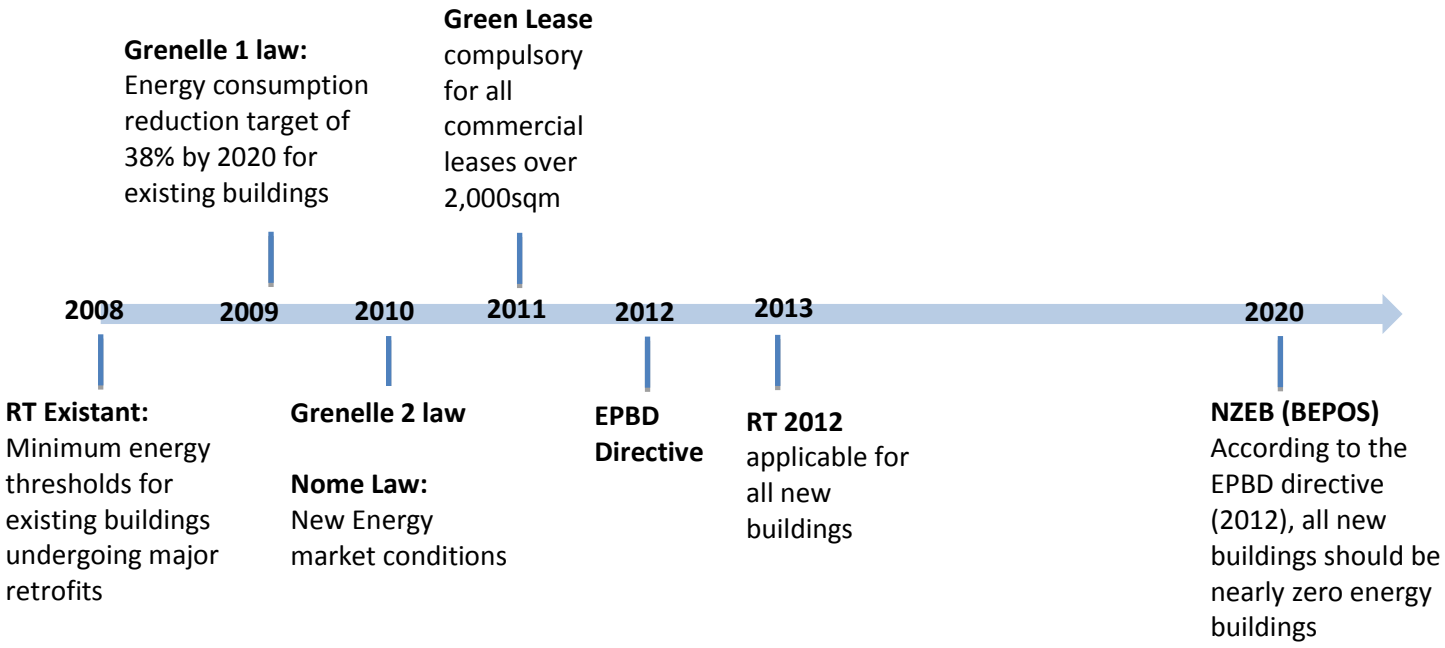
# Appendix 1: French regulatory framework for office buildings



# Appendix 2: Examples of tools and service providers offerings to tackle obsolescence related to sustainability-related concerns

| Name | Author / provider | Country | Launch year | Key features |
|---|---|---|---|---|
| TOBUS | European research consortium | EU | 2002 | Software to support decision-making for renovation of office building. The tool rests on an assessment of current building state and functional obsolescence for the diagnosis stage. Various refurbishment and retrofit scenarios are thus compared, in particular through costs assessments. The tool encompasses energy use and indoor environment quality although sustainability is not considered specifically. |
| Future proofing questionnaire | Sustainable Project Appraisal | UK | 2007 | Questionnaire to measure the future-proofness of buildings as regarding sustainability rising topics. Weightings are based on ranking of importance of sustainability criteria on long term asset value by a discussion group as the most important for the asset long term value. In the weightings, building adaptability ranks second after accessibility. |
| CarbonScreen® | Sinteo | France | 2009 | Solution for the mapping of the environmental performance of portfolios. The environmental of buildings is based on simplified assessments aiming at allowing comparisons independently of the differences in types of use and occupancy. In particular, an intrinsic energy performance indicator is built which only investigates energy consumption in a normalised framework. |
| GreenRating™ | Green Rating Alliance | UK initially | 2009 | Sustainability audit tool for existing buildings. The aim is to provide internationally comparable indicators to assess performance on six topics (Energy, Carbon, Water, Transport, Wellbeing and Waste) and make recommendations for improvements. Four level of performance are assessed separately: Intrinsic (performance of the building envelop as it is); Intrinsic Potential (this performance if recommended retrofits actions were implemented); Actual (actual consumption); Actual Potential (this consumption if recommended retrofits actions were implemented). |
| RehaGreen® | Bouygues Immobilier | France | 2009 | Commercial offering for sustainability upgrades to improve the long term value of existing buildings. A multicriteria diagnosis (technical installations, energy, regulatory requirements, urban context) is performed to determine the sustainability upgrades solutions which will created the more value for the building owner. Certifications schemes and labels are usually sought after to increase marketability. |

| | | | | |
|---|---|---|---|---|
| BBP Low Carbon Retrofit Toolkit | Better Building Partnership | UK | 2010 | The toolkit presents a roadmap as well as a catalogue of solutions to help overcome these barriers. All solutions proposed can be implemented within rented buildings. They do not require the building to be vacated. The stages highlighted in the roadmap are: 1. Define corporate retrofit goals 2. Designate roles & responsibilities 3. Prioritise building portfolio 4. Engage occupiers 5. Agree on financing arrangements 6. Select appropriate technology 7. Delivery with a performance guarantee. 8. Evaluate performance in-use. |
| DeltaGreen | Crédit Foncier Immobilier | France | 2011 | Consultancy services to accompany building owners in their definition and implementation of an energy efficiency strategy on their portfolio according to multi annuals repairs plan and occupancy. The analysis focuses simultaneously on three pillars: environmental assessment using technical and energy audits which are used to determined retrofits scenarios, legal assessment to investigate the feasibility of the retrofits scenarios considered and an assessment of potential impact on value using a market examination. |
| IPD EcoPAS | IPD | UK initially | 2012 | Benchmarking services for the environmental performance of portfolios. The tool is used to identify risks associated with sustainability-related features at a portfolio scale and benchmark exposures against peers. Each building is first appraised separately using a questionnaire set to identify sources of potential risks resulting from poor sustainability performance. |
| Regeneration Durable® | JLL | UK initially | 2012 | Decision-making toolkit for sustainability retrofits. Different investment scenarios (light retrofits, deep refurbishments, reuse, sale) are financially appraised according to the market context. Several zones are distinguished according to the level of value sustainability upgrades may bestow in a given location. |
| Revivalis | Kaufman & Broad | France | 2012 | Retrofit/ refurbishment offers describes as aiming to "reposition building in its market" and "transform obsolescence in opportunity". The first stage rests on a diagnosis of the strength and weaknesses of the building as regards energy consumption, functionality of the workplace, environmental risks (lead and asbestos). Retrofit/ refurbishment solutions are thus assessed according to legal constraints (regulation, architecture) and financial analysis. Labels and performance guarantees are also proposed to ensure marketability. |
| Retrofit Value Models | Rocky Mountain Institute | US | 2013 | The approach aim to assess how sustainability improvements add value to companies and the buildings they occupy. Value calculation encompasses saved energy costs, health and productivity gains, improved reputation, and risk reduction. |

| | | | | |
|---|---|---|---|---|
| Attractiveness index/ Indice d'attractivité | Nexity | France | 2014 | Toolkit to identify and remediate to the obsolescence of existing buildings, in particular associated to sustainability trends. Buildings are assessed on a grid encompassing more than 90 criteria on the following topics: accessibility and transportation, image and aesthetics, functionality and building quality, connectivity and grids, building services, comfort, utilities, health, operating expenses and use constraints. Assessment is thus used to identify weaknesses and propose solutions to improve building attractiveness. |
| Climate Risk Toolkit (CRT) | RICS | EU | 2015 | Toolkit aimed for the construction and real estate players in eight European countries (Germany, France, the United Kingdom, Ireland, Spain, Greece, Sweden and Norway) to anticipate the risks posed by climate change. The report examines the regulations (existing and in preparation) and investigates potential consequences for real estate assets. The report is accompanied by an online tool that assesses the extent to which a given building is climate change resilient. |

**Table 35: List of tools on the management of sustainability-related features for existing buildings**

This list is most probably not exhaustive. It encompasses offerings with specific communications on the management of sustainability for office buildings and focuses on France and leading European projects.

# GENERAL CONCLUSION

This thesis investigated sustainable real estate, and in particular the value it holds for the various stakeholders. Each chapter focused on different market players and different aspects of sustainable real estate to examine how it is perceived, and the extent to which the perception of its value motivates change. To conclude, this section summarises key results, before discussing more particularly the impact on the perception of the value associated with sustainability-related features on market players 'practices. A short discussion on the limits of the thesis is then used to suggest perspectives of further research.

## 1. Summary of key results

### 1.1. Value of sustainable real estate at asset level

Sustainability-related features in buildings generate benefits for the various stakeholders of the real estate sector: real estate owners, occupiers, final users (e.g. employees), local authorities, society at large, etc. These benefits are of a different nature. Some correspond to costs savings, whereas others refer to intangible gains, or more globally to adequacy with ethical beliefs. All these benefits are not necessarily passed on to investors/owners through market mechanisms (prices, occupancy rate, taxes, subsidies, etc.). The financial value associated with sustainable real estate thus differs from the total value associated with its multiple benefits for the different stakeholders. Two types of appraisal exercises should be distinguished. On the one hand, the financial appraisal reflects only benefits identified/anticipated as having an impact on the future cash flows for investors. On the other hand, the full identification of the potential benefits for the various stakeholders addresses a broader concept of value. **Chapter 1** argues that this second approach could be useful both to responsible investors aiming to make a true contribution to the sustainability agenda and to mainstream investors aiming to identify risks on their future financial cash flows.

### 1.2. Value of sustainable real estate at corporate level

For real estate companies, the value of sustainability-related features at asset level will translate into value at the corporate level. The value of sustainable real estate at corporate level is thus three-folds. It is composed of the added value for each asset, management gains at portfolio level, as well as corporate benefits resulting from improved image and improved competitiveness. **Chapter 2** suggests that companies have increasingly perceived the integration of sustainability-related issues as a key factor for the protection of their corporate value. Legitimacy motives appears to have led large real estate companies to a race to the most sustainable practices (at least in appearance), in

particular as regards the monitoring of energy performance and the certification of their assets under management. In addition, the analysis of change process suggests that core organisations are only slightly impacted by the integration of sustainability-related criteria. Deeper integration would require a shift in paradigm, from a prevailing financial rationale to an embedded perception of sustainability, with strategies driven by joint value creation with stakeholders.

## 1.3. Brand value of sustainability certification schemes

In practice, sustainability-related features in real estate are frequently assessed through the presence of labels and certifications schemes. Certification schemes have widely spread in the market and have now become market standards for large office buildings. **Chapter 3** suggests that this swift evolution can be explained by two key drivers occurring at different stages of the diffusion process. In the early stage of diffusion, the certification schemes have been integrated into the management systems of suppliers, through a standardisation of environmental management systems. In the later stage of diffusion, large companies have systematised their adoption of sustainable premises as part of their CSR policies. For occupiers seeking premises, certification schemes enable occupiers to identify buildings with sustainability-related features. They hold a brand value associated with the "sustainable image" they convey and the trust in the underlying sustainable performance. **Chapter 4** suggests that companies seeking certified premises are mainly motivated by image and CSR policy issues. The sustainable brand image of certification schemes is thus paramount to ensure the satisfaction of occupiers. However, as certified schemes become more widely spread and occupiers gain further experience on the actual performance of certified premises, one may wonder whether the green brand image will remain sufficient to ensure occupiers bestow higher value to certified buildings.

## 1.4. Impact on the financial value of the existing building stock

The diffusion of new sustainable buildings could result in a transfer of both occupiers and investors from low sustainable buildings to high sustainable buildings. The financial value of non-sustainable buildings among the existing stock could thus be negatively impacted on the mid to long term. Rising concerns on sustainability-related topics thus correspond to new factors of obsolescence for real estate. They have already been increasingly perceived as additional financial risks by investors. To counter this obsolescence, investors, sometimes advised by third parties analysts, undertake energy efficiency measures on their portfolio. For vacant premises, retrofits and refurbishments are used as opportunities to upgrade the sustainability performance of the buildings. **Chapter 5** suggests that real estate investors have acknowledged the financial impact of sustainability-related features, and have started improving the sustainability performance of their existing stock. However, most of them still focus on one-shot action with immediate yield, and neglect longer term trends. Sustainability-related improvements made today could thus prove insufficient in the future, and could even be harmful to broader sustainability strategies on the long term. A theoretical illustration is proposed to move from one-shot decisions to long term strategies reflecting the full retrofit and refurbishment cycles.

# 2. Discussion on the impact of the "green value talk" on practices

## 2.1. Criticisms from the literature

The idea that informing market players on sustainability-related benefits will be sufficient to foster sustainable practices is very seductive. This "value talk" (or "business case") in favour of sustainable practices represents a low cost and optimistic solution to the challenges raised by the sustainability agenda, with private market players voluntarily integrating sustainability-related criteria into their practices. It enables companies and investors to reduce tensions between financial performance targets and rising concerns as regards sustainability, and to legitimate the institutional changes required (Brammer *et al.,* 2012).

However, this reasoning is criticised by several authors. In particular, they note contradictions between "business-case" arguments and market transformation. At practical level, Carroll and Shabana (2010) remind that the "business case" is often reduced to a narrow view of sustainability-related benefits focusing on immediate costs savings rather than win–win relationships with stakeholders which could be more apt to trigger shifts. In addition, the implementation of the "business case" requires stakeholders to "reward" investors for their sustainable practices. However, stakeholders may not always be inclined to do so, thus preventing the installation of a virtuous circle (see Quairel-Lanoizelée, 2011).

More fundamentally, Capron and Quairel-Lanoizelée (2015) argue that the CSR business case relies on a disembedded vision of the relations between companies, society and the environment. It corresponds to a perception where sustainability targets are subordinates to financial conditions, rather than indispensables supports for the economic activities. Consequently, it does not sufficiently realign priorities compared to what the sustainability agenda would require.

## 2.2. Evidence from the thesis

Observations and findings from this thesis tend to support these criticisms, although some silver linings were also identified.

As regards the value of sustainable real estate, **Chapter 1** suggests that financial benefits focus the most attention in the attempts to better integrate sustainability-related criteria into investment decisions process. Due to market failures and externalities, it is highly unlikely that the financial value appraised by investors would reflect the full social costs and benefits associated with sustainability-related features, leading to an underinvestment in these features. However, investigations on a broader understanding of value are emerging.

As regards corporate strategies, **Chapter 2** highlights that the "green value" talk, relating to the publication of studies on the additional market value of sustainable buildings, is probably not a key driver in the implementation of sustainable practices among real estate companies. Regulation and

legitimacy mechanisms prevail. The “green value” talk appears rather as a mantra, brought forward subsequently to shed companies on their best light, motivate operational staff and top managers, and maybe make the rewards from stakeholders come true. Deeper organisational shifts could however emerge if current attempts to change relations with stakeholders and account for intangible benefits bear fruits.

In this regard, current certification schemes transpire both as a factor of progress and a hindrance according to **Chapter 3** and **Chapter 4**. Indubitably, their swift diffusion has contributed to a better accounting of environmental features at least during the design stage. In providing intermediate steps between environmental regulations, they have probably also allowed more stringent regulations to come forth. However, there are still focused on environmental management practices at the conception stage, to the detriment of actual performance in use. They neglect social and governance issues which would prove important for stakeholders, and provide few guarantees on additional value for both investors and their stakeholders, in particular occupiers.

Last, **Chapter 5** highlights that the ”green value” talk has contributed to (or at least not prevented) a short term approach of real estate management. Analysts and investors have gradually acknowledged that the rise of sustainability-related topics will impact the financial value of their existing buildings. However, although the impact will also be long term, they mostly focus on short term and one-shot measures. Their actions are guided by a “narrow” business case, encompassing mainly current market trends. As a consequence, they tackle existing buildings as financial assets which they manage to maximise immediate yields, rather than as a standing stock which would require a more long-term management.

# 3. Limits of thesis and perspective for further research

Each chapter presents its own discussion. This section merely discusses main limits of the general research approach and the associated perspectives for further research.

## 3.1. Limits of the French context

This thesis mainly draws empirical evidence from the French context. Further research could entail a comparison between various countries. In the different chapters, comparisons with results from the literature suggest that mechanisms at stake are overall very similar for mature real estate markets. However, national specificities could exist, in particular with respect to regulatory frameworks. In addition, few articles were published on developing markets.

## 3.2. Operational methodologies of integration into investment decision context

This thesis examined various projects and practices as regards the integration of sustainability-related criteria into investment practices. Using a discussion on the main pitfalls of these approaches, it proposed recommendations to improve existing practices. However, providing a practical methodology to do so was not its focus. Professional reports (e.g. UNEP FI, 2014) have stated the need for further research in this regard. During the period of my thesis, I contributed to a project from the Sustainable Building Alliance (SBA) which aimed to make recommendations on this topic. Other perspectives as regards operational tools include Building Information Modelling (BIM), which have been widely investigated from an engineering angle but less so as a management tool for financial teams.

## 3.3. Market segmentation and matching demand

**Chapter 5** alludes to different possible long term impacts of sustainability concerns on the value of non-sustainable buildings. However, the thesis does not discuss all of them fully. As sustainability-related features become mainstream for new developments and retrofits, two main separate scenarios could unfold. First, the new supply of sustainable buildings could result in a transfer of investors (in the asset market) and occupiers (in the space market) from old non-sustainable buildings to newer more sustainable buildings. This would lead to the diffusion of sustainable buildings to the whole market. Second, a market segmentation could take place, with on the one hand new sustainable high quality premises, and on the other hand cheap lower quality buildings.

Market segmentation corresponds to situations where "*heterogeneity in demand functions exists such that market demand can be disaggregated into segments with distinct demand functions*" (Dickson and Ginter, 1987, p.4). As regards sustainable real estate, some occupiers may value rental costs over the sustainability performance of their premises. Rather than spread to all market segments, sustainability-related features could thus remain focused on the high quality market, since investors would have no occupiers demand for sustainability-related features in the lower quality market.

Further research would be required to investigate this possible market segmentation. This research stream could prove useful to analyse occupiers' willingness-to-pay for sustainable features, as well as to examine the importance of sustainability-related criteria in the negotiations between occupiers and investors for rental prices setting and lease renewal. In this regard, marketing literature on market segmentation as well as matching models drawn from literature on wage negotiation in labour economics, represent potential pathways to explore.

## 3.4. In-use labels and new generation of certification schemes

During the period of the thesis, in-use labels were still emerging in the French market. **Chapter 3** and **Chapter 4** thus mainly focused on certification schemes for the construction stage, and disregarded in-use certification schemes aimed at the operation stage. This choice was further justified by the purpose of the research, i.e. examining the role of certification schemes and labels in decision-

making process for occupiers. Certification schemes aimed at the construction stage are mostly planned before the negotiation between occupiers and investors (except for build-to suit operations). It was thus consistent to study these labels as a factor in the decision process. However, in-use labels may be obtained separately by owners, occupiers and facility managers, while occupiers are already renting the premises. These labels can no longer be analysed as pre-existing to the negotiation. Different research approaches would thus be required to examine the role of in-use labels in the relations between these various market players, in particular during lease negotiations.

In addition, investigating the impact of the diffusion of in-use labels on the value of existing premises could also be interesting. Whereas buildings with a label obtained for the construction stage were mostly in competition with new buildings, in-use labelled premises are in direct competition with existing buildings. Canada would probably provide a prime data field to do so, since BOMA BESt® is one of the oldest sustainability certification schemes for existing buildings.

Similarly, new generations of labels are being launched to answer some criticisms they previously faced, in particular as regards their role to guarantee additional value to occupiers. In North America, the WELL Label was launched in October 2014. It aims to better reflect occupiers' concerns, in particular as regards health, comfort and satisfaction. In France, a new framework for the HQE certification scheme was announced in May 26$^{th}$ 2015. It would be interesting to investigate the extent to which these new frameworks answer criticisms and meet expectations.

# 4. Further outlooks

The integration of sustainability-related features into real estate practices is still on-going. Development of new certifications schemes and labels, strengthening of regulations, elaboration of new decision-support tools, publications of guidance notes and sectorial standards, etc. will continue to shape real estate practices. Tremendous changes have already occurred. However, I wonder whether these changes will be sufficient to meet the sustainability agenda. In the coming years, the sector will probably need to undergo deeper transformations to be equal to the task.

## 4.1. Shifting the paradigm

The changes that occurred over the last years did not call into question the grounds of actual organisations. The level of ambitions of sustainable practices is more often than not disputable, and sustainability-related features are still subordinated to financial considerations. Regarding CSR, Capron and Quairel-Lanoizelée (2015) criticise this disembedded vision of economic activities. They urge for an embedded perception where the social and environmental systems support economic activities. This would require investors and companies to acknowledge that they are accountable to society and the environment, which support their operations. In real estate, Hill and Lorenz (2011) thus call property professionals to rethink their role towards society. Du Plessis and Cole (2011) advocate a shift in paradigm to motivate the change. In practice, they call for a redefinition of the

role of stakeholders, as well as the elaboration of new assessment systems which would better account for the holistic nature of sustainability-related features.

## 4.2. Inventing new relations with stakeholders

The integration of sustainability-related features into real estate does not merely impact investors. It also affects other stakeholders, which interests need to be accounted for to better account for sustainability-related concerns. Integrating stakeholders into the decision-making process and expanding their definitions to include society and the environment represent a pathway towards this transformation (Du Plessis and Cole, 2011). This requires encouraging dialogue and inventing new models of collaboration. Engaging with stakeholders could thus allow the development of new assessment tools more adapted to reflect the various aspects of sustainability (Cole, 2005). For example, this could nurture the elaboration of the cross-scale (building, neighbourhood, urban development) and multi-stakeholders evaluation approaches advocated by Conte and Monno (2012) to extend beyond the current "*building-centric approach*" of assessment frameworks.

## 4.3. Redefining real estate assets

This shift in paradigm may also require rethinking the perception of real estate as an asset class. Over the last forty years, investors have moved from a patrimonial management of real estate to a financial approach where real estate is managed like any other asset classes, using financial methods such as optimal portfolio allocation (Nappi-Choulet, 2010). This "financialisation" of real estate is the context in which sustainability-related practices are framed (Boisnier, 2014). Better integrating sustainability concerns would benefit from questioning this perception of real estate as a mere financial asset.

Real estate is not a financial asset class like any others. In particular, it rests on buildings, with specific physical properties. It evolves over time, and requires a constant flow of investment to be maintained in good conditions (Bryson, 1997). Besides, complex relationships also exist between real estate, urban development, our ways of life, and environmental systems (Conte and Monno, 2012). On the whole, Reed (2007) explains that real estate presents many similarities with "*complex living systems*".

Investigating real estate as an evolving metabolism could help better manage buildings over time. The analogy between existing building stock and standing forests, embraced in the theoretical illustration of **Chapter 5**, represents a first simple attempt in this direction. It aims to highlight the regenerative features associated with buildings (through refurbishment and retrofit works). Research on urban metabolism (see for example Salat and Bourdic, 2012) provides a broader avenue to explore this analogy further.

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# RESUME LONG EN FRANCAIS

Alors que les préoccupations en faveur du développement durable s'étendent et que la Responsabilité Sociale des Entreprises (RSE) s'institutionnalise, les enjeux de durabilité deviennent une tendance forte du secteur immobilier. Cette thèse examine l'immobilier durable, et explore plus particulièrement la valeur que les différentes parties prenantes y associent. Elle se concentre sur l'immobilier de bureaux, à partir de données empiriques principalement issues du contexte français. Les principaux résultats semblent cependant duplicables aux autres marchés immobiliers mâtures.

## 1. Eléments de contexte

### 1.1. Développement durable et immobilier durable

Il n'existe pas de définition communément admise de l'immobilier durable (Berardi, 2013). Dans son acceptation la plus générale, l'immobilier durable peut être défini comme des pratiques immobilières qui contribuent au développement durable (Lützkendorf and Lorenz, 2005). Cependant, cet objectif de durabilité ne doit pas être réalisé au détriment de l'utilité sociale des bâtiments, à savoir fournir des espaces fonctionnelles et confortables à ses occupants. Dans sa définition, la norme internationale ISO 15392:2008 met clairement en évidence ce point, en déclarant[56]: « *L'application du concept de développement durable à des bâtiments et autres ouvrages de construction spécifiques suppose une approche holistique, prenant en compte à la fois les préoccupations et objectifs globaux du développement durable et les exigences de fonctionnalité des produits, de performance et d'économie* ». Cette définition porte sur l'objet final de l'immobilier durable, sans spécifier les moyens pour y aboutir (innovations technologiques, changements comportementaux, pratiques d'investissement responsable, …). Chaque partie prenante du secteur de l'immobilier et de la construction a ainsi sa propre perception de l'immobilier durable, et met en œuvre des approches qui lui sont propres.

Néanmoins, il n'est pas évident que les pratiques aujourd'hui mises en œuvre sont suffisantes par rapport aux défis environnementaux et sociaux posés au secteur. Cole (2011) estime que les changements nécessaires demanderont de motiver davantage l'ensemble des parties prenantes, et plus globalement de changer leurs modes d'interventions dans les différentes phases du cycle immobilier (conception, développement et management des bâtiments). A cet égard, des associations professionnelles à l'image du World GBC ont tenté de promouvoir le « business case » de l'immeuble durable. Ils ont ainsi cherché à mettre en avant l'ensemble des bénéfices de l'immobilier durable pour les diverses parties prenantes du secteur de l'immobilier et de la construction. L'idée sous-jacente à ces tentatives est qu'en informant les acteurs des bénéfices

[56] ISO 15392:2008. Développement durable dans la construction — Principes généraux. Accessible en ligne à : https://www.iso.org/obp/ui/fr/#iso:std:iso:15392:ed-1:v1:fr

économiques et financiers qu'ils peuvent espérer des immeubles durables, ces derniers prendront d'eux-mêmes mieux en compte les critères environnementaux et sociaux dans leurs activités immobilières. Dans ce contexte, comprendre la valeur de l'immobilier durable pour les acteurs apparait primordiale pour promouvoir la mise en place d'un immobilier plus durable.

## 1.2. Les acteurs du marché de l'immobilier

Avant d'approfondir le thème de l'immobilier durable, il apparaît ainsi important de comprendre comment les marchés immobiliers sont organisés et quels en sont les principaux acteurs.

Le secteur de l'immobilier correspond à deux marchés liés : un marché des locaux immobiliers et un marché des actifs immobiliers (Geltner *et al.,* 2010). Sur le marché des locaux immobiliers (marché de l'espace) des locataires prennent à bail des surfaces fournis par des propriétaires immobiliers, en contrepartie de loyers qui dépendent de la localisation, du type et des caractéristiques des surfaces louées. Pour les immeubles de bureaux, les locataires correspondent à des entreprises cherchant des locaux pour accueillir leurs activités et leurs employées. Sur le marché des biens immobiliers, des investisseurs sont en compétition pour l'acquisition d'actifs immobiliers (propriété de l'immeuble, part de copropriété, …). L'immobilier est alors traité comme un actif financier à part entière, similaire aux actions ou aux obligations. Les prix des biens sont liés aux flux de revenus que les investisseurs anticipent pour la possession du bien. Par ailleurs, l'offre et la demande d'espace immobilier dépend de la production d'immeubles neufs et de restructurations. Cette production est généralement orchestrée par des promoteurs qui agissent au nom d'investisseurs identifiés ou potentiels et servent d'intermédiaires avec les entreprises de construction.

En plus de ces principaux types d'acteurs, d'autres agents jouent également un rôle dans le secteur. Les investisseurs et les développeurs sont en lien avec d'autres acteurs financiers, notamment avec des banques qui peuvent leurs prêtent les fonds nécessaires à leurs opérations, et des compagnies d'assurance. Des conseillers et intermédiaires juridiques et financiers (notaires, évaluateurs, conseils en transaction, etc…) interviennent généralement lors des transactions. La gestion des bâtiments existants fait généralement intervenir des « property managers », en charge des opérations courantes (collecte des loyers, commande de travaux de maintenance), et des « facility managers » en charge de la gestion des fluides (énergie, eau, ventilation). Enfin, les collectivités locales, et plus généralement les autorités publiques régissent le contexte légal dans lequel les acteurs opèrent.

Ces acteurs de marché ne forment pas des groupes homogènes. Ils peuvent avoir différentes motivations pour la prise en compte des critères et environnementaux dans leurs pratiques. A cet titre, ils doivent être examinés séparément (Lützkendorf *et al.,* 2011).

## 1.3. L'immobilier durable en pratique

Les caractéristiques de durabilité dans les bâtiments ne sont pas des développements récents. L'énergie, et plus particulièrement la puissance installée, est un enjeu récurrent des réglementations du secteur. Ainsi, en France, il existe une réglementation thermique qui couvre l'utilisation énergétique dans les bâtiments (chauffage, climatisation, ventilation, auxiliaires et éclairage) depuis

1974. Cependant, les thématiques concernées sont longtemps restées cantonnées à un nombre restreint de sujets aux mains de techniciens, avec un impact très limité pour l'organisation du secteur. Au cours des quinze dernières années, les thématiques environnementales et sociales ont fait l'objet d'une attention accrue. Nappi-choulet (2010) décrit cette tendance comme une mutation du secteur comparable à celle associée à la « financialisation » de l'immobilier. Nelson *et al.* (2010) notent que la prise en compte de critères environnementaux n'est plus une pratique de niche. Elle n'est plus cantonnée à des équipes techniques dédiées, et affecte l'ensemble des parties prenantes.

### *A l'échelle du bâtiment*

A l'échelle du bâtiment, la réglementation est un moteur clé de ce changement. Historiquement, les cadres réglementaires sont principalement tournés vers la réduction de la consommation énergétique des nouveaux bâtiments et des rénovations. Au cours des dix dernières années, les réglementations thermiques ont divisé par trois les consommations énergétiques des bâtiments nouvellement construits. Et le mouvement continue, puisque la législation européenne [57] prévoie que tous les nouveaux bâtiments soient à énergie positive (« bâtiment à consommation quasi nulle » dans le texte) d'ici à 2020. Pour préparer le marché à ce renforcement réglementaire, des labels énergétiques ont été créés, à l'image des labels BBC (Bâtiment Basse Consommation) et BEPOS (Bâtiment à énergie positive) en France. En outre, la publication d'étiquettes énergie-climat pour rendre facilement disponible l'information sur la consommation des immeubles a été rendue obligatoires lors des transactions locatives et des ventes de biens immobiliers.

Cependant, les critères de durabilité dans le bâtiment ne peuvent pas être réduits aux seuls critères énergétiques. Ils englobent également les thématiques environnementales et sociales comme le confort, la santé et la sécurité, tout au long du cycle de vie des immeubles. Des cadres volontaires, comme les certifications environnementales, se sont développés et forment un cadre pour répondre à ces sujets. Depuis, 1990, de nombreuses certifications sont ainsi apparues dans le monde (voir Cole, 2005 pour plus de détails), à l'image de BREEAM au Royaume-Uni, de LEED en Amérique du Nord, de DGNB en Allemagne, et de HQE en France.

Sur le marché français, la certification HQE (Haute Qualité Environnementale) est la plus répandue. Depuis le lancement officiel des premières certifications en 2005[58], le nombre d'opérations certifiées a rapidement cru parmi les nouveaux développements. Sept ans plus tard, la certification s'imposait comme un standard de marché sur le marché francilien de bureaux. En 2012, les trois quarts de l'offre neuve étaient certifiées (DTZ-Novethic, 2013). A l'origine, la plupart des certifications environnementales du bâtiment était conçue pour la phase de conception/construction voire de rénovation. Plus récemment, les organismes de certification ont élaboré des labels spécifiques dédiés à la phase d'exploitation des immeubles, à l'image de BOMA BESt® au Canada, de BREEAM In-Use au Royaume-Uni, de LEED E-BOM aux Etats-Unis, et de la HQE Exploitation en France. En outre, des systèmes de notations ont également vus le jour comme GreenRating®, CarbonScreen®, … Ces outils sont utilisés par les investisseurs et les propriétaires pour mesurer et comparer la performance de leurs bâtiments en portefeuille.

[57] Les deux principales directives européennes en ce qui concerne la consommation énergétique des bâtiments sont la directive 2010 pour la performance énergétique des bâtiments, et la directive 2012 pour l'efficacité énergétique. Elles imposent aux pays membres de se munir d'un niveau minimal de performance énergétique pour les nouveaux bâtiments et les rénovations.

[58] L'approche HQE a été développée en 1996. Elle n'est cependant devenue une certification qu'en 2005.

### *A l'échelle des organisations*

A l'échelle des organisations, la Responsabilité Sociale des Entreprises (RSE) ainsi que l'Investissement Responsable (IR) contribuent à l'intégration des critères environnementaux et sociaux dans les décisions.

La Responsabilité Sociale des Entreprises se réfère au devoir des entreprises vis-à-vis de la société. Dans sa définition amendée de 2011, la Commission Européenne explique ainsi :

*« La Commission propose de redéfinir la RSE comme étant «la responsabilité des entreprises vis-à-vis des effets qu'elles exercent sur la société». Pour assumer cette responsabilité, il faut au préalable que les entreprises respectent la législation en vigueur et les conventions collectives conclues entre partenaires sociaux. Afin de s'acquitter pleinement de leur responsabilité sociale, il convient que les entreprises aient engagé, en collaboration étroite avec leurs parties prenantes, un processus destiné à intégrer les préoccupations en matière sociale, environnementale, éthique, de droits de l'homme et de consommateurs dans leurs activités commerciales et leur stratégie de base, ce processus visant:*

- *à optimiser la création d'une communauté de valeurs pour leurs propriétaires/actionnaires, ainsi que pour les autres parties prenantes et l'ensemble de la société;*
- *à recenser, prévenir et atténuer les effets négatifs potentiels que les entreprises peuvent exercer.*" »

(Commission Européenne, 2011, p.7)

L'investissement Responsable (RI) se réfère aux pratiques des investisseurs. Il peut être défini comme l'intégration de critères environnementaux, sociaux et de gouvernance dans les décisions d'investissement. A l'origine appliquées aux actions cotées, ces pratiques se sont progressivement étendues aux autres classes d'actifs. Elles sont promues par les Principes pour l'Investissement Responsable (PRI), une organisation internationale dans laquelle les investisseurs institutionnels et les gérants d'actifs s'engagent à intégrer les critères ESG dans leurs pratiques d'investissement et à reporter sur celles-ci.

Au cours des dernières années, la RSE et l'IR se sont étendus sous l'effet d'un contexte institutionnel en faveur de ces comportements responsables (Campbell, 2007). Cette forte pression normative provient notamment de normes et standards internationaux (les principes directeurs de l'OCDE, les lignes directrices des Nations Unies sur les entreprises et les droits de l'homme, …), la réglementation en ce qui concerne notamment les obligations de reporting extra-financier, la présence d'agences de notations extra-financières suivant la performance des entreprises, les organisations internationales promouvant des comportements responsables (Global Compact, PRI, Initiative pour la finance du PNUE (UNEP FI), …), les labels et certifications environnementales, … (voir Capron et Quairel-Lanoizelée (2010) pour plus de détails).

Le secteur de l'immobilier et de la construction n'a pas été laissé de côté par ces tendances. Des organismes sectoriels comme la RICS pour les professionnels, l'EPRA pour les sociétés cotées, l'INREV pour les gérants de fonds non cotés, le groupe de travail sur l'immobilier de l'UNEP FI, ont publié des guides, des notes de travail et autres publications dédiés à la prise en compte des critères extra-financiers. Parallèlement, des organisations spécifiquement créées pour la promotion de l'immobilier durable ont vu le jour, comme le World Green Building Council (World GBC) et ses branches nationales, la plateforme de notation GRESB (Global Real Estate Sustainability Benchmark) ou encore l'Observatoire de l'Immobilier Durable en France.

# 2. Approche de recherche

## 2.1. Motivation de la recherche

Le secteur de l'immobilier et de la construction est considéré comme crucial pour répondre aux défis posés par le développement durable, du fait de la taille de ces impacts et du coût modéré des actions nécessaires. En particulier, il est considéré comme le secteur où les coûts de la contribution à la lutte contre le changement climatique sont les plus bas (EEFIG, 2015). En France, le secteur est responsable de 43% de la consommation finale nationale d'énergie, de 25% des émissions de gaz à effet de serre, de 16% de la consommation d'eau et de 40% de la production de déchets[59]. En outre, le secteur fait également l'objet de nombreux sociaux et sociétaux. Il participe au développement urbain, et à la construction des villes et plus généralement de l'espace dans lesquels nous évoluons. A cet égard, confort et santé dans les bâtiments sont primordiaux. Le secteur est également largement exposé aux risques de corruption, de conflits d'intérêts et au travail illégal[60].

Afin de répondre à ces défis, de profonds changements seront nécessaires (Du Plessis and Cole, 2011). Outre les instruments réglementaires, les mécanismes de marché ont été mentionnés pour aider à cette transition. En particulier, le « business case » de l'immobilier durable, et de la RSE plus généralement, sont souvent évoqués pour promouvoir la mise en place de pratiques plus responsables auprès des acteurs de marché (Carroll and Shabana, 2010). Les acteurs, informés des bénéfices associés à ces bonnes pratiques (ou des risques associés à l'absence d'actions) prendraient ainsi volontairement en compte des considérations environnementales et sociales. Mettre en évidence la valeur de l'immobilier durable et améliorer les outils d'aide à la décision afin qu'ils prennent mieux en compte les critères liés à la durabilité sont donc apparus comme des facteurs clés pour promouvoir le développement durable en immobilier (Lorenz and Lützkendorf, 2011).

Cette thèse contribue à cette discussion en explorant la valeur de l'immobilier durable pour divers parties prenantes, et surtout en examinant dans quelle mesure la perception que les acteurs ont de cette valeur façonne leurs pratiques. La thèse questionne ainsi l'efficacité des approches existantes de valorisation de l'immobilier durable pour promouvoir des pratiques alignées sur les objectifs de développement durable.

## 2.2. Caractéristiques de l'objet de recherche

L'objet de recherche de cette thèse est l'immobilier durable. En tant que partie de l'environnement bâti, l'immobilier durable est un vaste champ de recherche, qui implique diverses disciplines : l'ingénierie, l'architecture, l'économie, la droit, la finance, la gestion, la sociologie des organisations, la physiologie humaine… (Chynoweth, 2009). Pour rendre compte de la complexité de cet objet de recherche multifacette, cette thèse tente de suivre les conseils de l'économiste Edgar Morin d'analyser la complexité de manière non simplifiante en recherchant un savoir transdisciplinaire (Morin, 2005). Cette thèse entend ainsi examiner différentes perspectives au travers de divers cadres

[59] CSTB/UNEP/SBCI (2013) State of Play of Sustainable Building in France 2012. Available online at: http://www.planbatimentdurable.fr/sortie-officielle-du-rapport-state-a762.html

[60] Selon le ministère du travail, le secteur de la construction totalisait 43% des fraudes pour travail illégal en 2012.

théoriques pour comprendre comment l'immobilier durable est perçu par les parties prenantes, et quel sens elles donnent à sa valeur.

La thèse vise aussi à apprécier la nature dynamique de son objet de recherche. La montée des préoccupations environnementales et sociales en immobilier est un mouvement en cours. Les réglementations et les certifications associées évoluent rapidement, de même que les perceptions et les pratiques des acteurs. Tout au long de ces quelques trois années de thèse, j'ai pu observer des changements notables à la lecture de la documentation des acteurs (rapport RSE en particulier) et lors des interviews des acteurs. Pour rendre compte de ces évolutions, j'ai cherché tant que ce peut à adopter une approche dynamique, au travers d'analyses empiriques longitudinales et d'observations dans le temps, afin d'étudier les processus de changement à l'œuvre.

## 2.3. Contexte de recherche

Cette thèse a été entreprise dans le cadre d'un contrat CIFRE[61] entre le laboratoire de recherche et le centre français de recherche sur l'investissement responsable Novethic.

Ma position chez Novethic m'a permis d'analyser les entreprises foncières cotées (entreprises de construction, promoteurs, et sociétés foncières), les sociétés de gestion de fonds immobiliers non cotés, ainsi que les investisseurs institutionnels. Ce poste m'a facilité l'accès aux acteurs de marché, et a rendu possible de confronter leurs déclarations avec des informations plus détaillées sur leurs pratiques effectives. Les travaux réalisés ont également été nécessaires pour identifier les tendances qui ont été davantage creusées dans le cadre des travaux de recherche. En outre, j'ai eu l'opportunité de participer, d'abord comme membre du projet puis comme simple observatrice, à l'élaboration de la stratégie pour l'amélioration de l'efficacité énergétique du portefeuille immobilier d'investissement de la Caisse des Dépôts et des Consignations, un grand investisseur institutionnel public français. Cette expérience m'a permis de m'immerger dans les pratiques d'un investisseur en immobilier et de mieux comprendre les processus internes de prise de décision en matière d'amélioration environnementale.

Afin d'obtenir l'accès à des données sur les transactions de marché, j'ai fait appel à des brokers. Ces acteurs suivent les transactions sur les locations et les ventes de biens tertiaires. Leurs données sont confidentielles, et ils les considèrent comme stratégiques puisqu'indispensables à leur métier de conseil en transaction, d'expertise immobilière et d'étude de marché. DTZ Research, le département d'étude du broker DTZ a cependant accepté de m'ouvrir leurs bases de données pour ma recherche.

Par ailleurs, j'ai eu l'occasion de participer à un projet de recherche international financé par le Sustainable Building Alliance (SBA) intitulé "*Sustainability thresholds generating value*". Ce projet visait à proposer des recommandations concrètes aux acteurs de marché (organismes de certification d'une part, et analystes financiers et évaluateurs d'autre part) pour la meilleure intégration des critères environnementaux et sociaux dans les décisions d'investissement. Cette expérience m'a permis de prendre du recul sur le travail du chercheur, qui observe les pratiques mais peut également contribuer à leurs transformations.

[61] Convention Industrielle de Formation par la Recherche en Entreprise

## 2.4. Structure de la dissertation

La dissertation est composée de cinq chapitres, écrit comme des articles disjoints. Par soucis de clarté, ils ont été regroupés dans cette thèse en trois parties, correspondant aux trois angles de recherche sur l'immobilier durable.

La première partie est composée des deux premiers chapitres. Elle s'interroge sur la notion de valeur associée avec l'immobilier durable, et vise à questionner les limites du « business case » sur l'immobilier durable pour promouvoir les pratiques durables.

- Le **Chapitre 1** utilise une approche théorique pour examiner la valeur des caractéristiques environnementales et sociales des bâtiments. A partir d'une revue de la littérature et des projets existants sur la valeur de l'immobilier durable, il identifie et confronte quatre types d'approches principales de valorisation. Chaque approche est discutée au regard de sa contribution au développement durable à partir de concepts issus de l'économie de l'environnement.

- Le **Chapitre 2** examine la valeur de l'immobilier durable à l'échelle des entreprises immobilières. Elle fournit une étude empirique sur la manière dont les foncières perçoivent l'impact de l'immobilier durable pour la valeur de leur entreprise, et comment cette perception a influencé leurs stratégies et leurs organisations. Elle repose pour cela sur une analyse des communications publiques (rapports annuels, rapports RSE) des 20 plus grandes foncières cotées françaises entre 2008 et 2013. Les résultats sont interprétés à l'aide de la littérature sur la RSE et des théories institutionnelles.

La seconde partie comprend les troisième et quatrième chapitres. Elle se concentre sur les certifications environnementales, notamment la certification HQE française. Ce focus est motivé par l'importance des certifications sur le marché de l'immobilier durable, puisque les certifications sont généralement utilisées comme signal de la performance durable des actifs.

- Le **Chapitre 3** étudie la diffusion des certifications sur le marché des grandes surfaces de bureaux franciliennes. Il examine successivement leur diffusion au sein des fournisseurs de surfaces (promoteurs et investisseurs propriétaires), et au sein de la demande de surfaces (entreprises occupant des bureaux). Les données utilisées sont respectivement des informations statistiques sur l'offre neuve ou restructurée, et une base de données sur les transactions de bureaux de plus de 5000m² en Ile-de-France entre 2005 et 2013. Les modèles de diffusion des innovations ont permis d'explorer les séquences temporelles dans la pénétration de la certification HQE sur le marché.

- Le **Chapitre 4** examine plus en détail la demande pour les surfaces certifiées. Il s'interroge sur l'existence d'une demande au-delà de la valeur de marque des certifications, en étudiant comment la perception des certifications influence les motivations des entreprises pour occuper des immeubles certifiés, leur choix de relocation ainsi que leur occupation effective de locaux certifiés. Un cadre conceptuel liant perceptions, motivations, critères de choix et décisions effectives est élaboré à l'aide de la littérature sur les écolabels, et sur la valeur de marque. Des modèles de médiations sont utilisés pour tester ce cadre.

La dernière partie correspond au cinquième chapitre. Elle vise à explorer l'impact de la durabilité sur la valeur de long terme des actifs immobiliers.

- Le **Chapitre 5** examine l'impact de la montée des préoccupations liées au développement durable sur la valeur financière du stock de bâtiments existants. Il suggère que ces préoccupations représentent un facteur additionnel d'obsolescence pour les bâtiments, et examine comment ce risque est géré par les investisseurs. Pour cela, il s'appuie sur une analyse des pratiques des investisseurs (gérants de fonds non cotés et investisseurs institutionnels) ainsi que sur une revue de projets et d'outils d'aide à la décision utilisés pour gérer les risques d'obsolescence associés aux mauvaises performances environnementales et sociales. Un modèle simplifié, inspiré des modèles utilisés en économie de la forêt, est présenté pour illustrer les limites des pratiques existantes.

Le **Table 1** synthétise les objets d'études, les objectifs de recherche et les approches de chacun des cinq différents chapitres.

| | **Chapitre 1** | **Chapitre 2** | **Chapitre 3** | **Chapitre 4** | **Chapitre 5** |
|---|---|---|---|---|---|
| **Thématique** | **Clarifier le concept de valeur** | **Durabilité et stratégies de création de valeur à l'échelle des entreprises** | **Diffusion des certifications environnementales** | **Perception des certifications par les occupants** | **Impact sur l'obsolescence du stock de bâtiments existants** |
| **Problématique** | Que veut dire valoriser la durabilité en immobilier? | Comment et dans quelle mesure les foncières intègrent-elles la durabilité dans leurs stratégies de création de valeur? | Comment les certifications environnementales se sont-elles diffuses sur le marché français? | Existe-t-il une demande pour l'immobilier durable au-delà de la valeur de marque des certifications? | Comment la durabilité pourrait-elle être mieux prise en compte dans les décisions d'investissement pour les bâtiments existants? |
| **Principaux acteurs de marché considérés** | Investisseurs et leurs parties prenantes | Foncières | Promoteurs et entreprises utilisatrices de locaux | Entreprises utilisatrices de locaux | Investisseurs propriétaires |
| **Données**<br><br>**Approches** | Revue de projets existants et discussion critique | Analyse de la communication RSE des 20 plus grandes foncières cotées françaises entre 2008 et 2013 | Analyse des transactions sur les surfaces de bureaux franciliennes de plus de 5000 m² entre 2005 et 2013 | Enquête auprès de dirigeants immobiliers d'entreprises. Tests des hypothèses à l'aide de modèles de médiation | Analyse des investisseurs et revue d'outils existants. Discussion à l'aide d'un modèle théorique |
| **Cadre conceptuel** | Economie de l'environnement | • Littérature sur la RSE<br>• Théories néo-institutionnels<br>• Changement organisationnel | • Diffusion des innovations<br>• Littérature sur les écolabels | • Littérature sur les écolabels<br>• Littérature sur l'image de marque | • Obsolescence immobilière<br>• Calcul d'investissement<br>• Economie de la forêt |

**Tableau 36: Présentation des articles de recherche**

# 3. Principaux résultats

Les principaux résultats de chacun des cinq chapitres sont présentés ci-dessous. L'accent est mis sur les résultats en lien avec la valeur de l'immobilier durable.

## 3.1. Valeur de l'immobilier durable à l'échelle du bâtiment (chapitre 1)

Les performances environnementales et sociales des immeubles génèrent des bénéfices pour les diverses parties prenantes du secteur de l'immobilier : propriétaires immobiliers, mais aussi entreprises utilisatrices de locaux, occupants finaux (les employés des entreprises utilisatrices), autorités locales, société en général… Ces bénéfices sont de différents types. Certains correspondent à des économies de coûts (factures d'eau et d'électricité par exemple), tandis que d'autres se réfèrent à des gains intangibles (confort, gains de réputation) et plus généralement à l'adéquation avec des valeurs éthiques (valeur culturelle et environnementale). Tous ces bénéfices ne sont pas nécessairement reflétés aux investisseurs par des mécanismes de marché (prix, liquidité des actifs, taux de vacances, taxes ou subventions…). La valeur financière associée à l'immobilier durable diffère donc de sa valeur totale pour l'ensemble des parties prenantes.

Deux types d'évaluation doivent être distingués. D'une part, les évaluations financières reflètent les bénéfices identifiés ou anticipés comme ayant un impact sur les flux de revenus futurs des investisseurs. D'autre part, la cartographie de l'ensemble des bénéfices pour les diverses parties prenantes recouvre un concept plus large de valeur. J'argumente que cette seconde approche encore sous utilisée est importante tant pour les investisseurs responsables souhaitant apporter une véritable contribution au développement durable, que pour les investisseurs « mainstream » préoccupés par leurs intérêts financiers afin d'identifier les risques futurs sur leurs flux de revenus.

## 3.2. Valeur de l'immobilier durable à l'échelle des organisations (chapitre 2)

Pour les sociétés foncières, la valeur de l'immobilier durable à l'échelle des bâtiments se traduira en valeur pour l'entreprise. La valeur de l'immobilier durable pour l'entreprise est ainsi constituée de la valeur additionnelle à l'échelle de chaque immeuble détenue, des gains de gestion à l'échelle des portefeuilles et de bénéfices à l'échelle de l'entreprise associée à une meilleure image pour les différentes parties prenantes (locataires, employées, investisseurs) et à une meilleure compétitivité.

Je suggère que les foncières ont de plus en plus perçu l'intégration des critères environnementaux et sociaux dans leur gestion immobilière comme un facteur clé de réussite pour la protection de la valeur de l'entreprise. La légitimité apparaît comme le moteur clé de cette intégration, et semble avoir amené les entreprises dans une course pour les pratiques les plus durables (du moins en apparence), notamment en ce qui concerne le suivi de la performance énergétique et la performance environnementale des actifs sous gestion. De plus, l'analyse des processus de changement suggère que les modèles économiques n'ont été que légèrement influencés par l'intégration de ces critères extra-financiers. Une intégration plus en profondeur nécessiterait un changement de paradigme, et

le passage d'une prévalence financière à une vision encastrée de la durabilité, avec des stratégies cherchant la co-création de valeurs avec les parties prenantes.

## 3.3. Valeur de marque des certifications environnementales (chapitres 3&4)

En pratique, les critères environnementaux et sociaux en immobiliers sont principalement analysés à partir de la présence de labels ou de certifications environnementales. Les certifications se sont largement diffusées sur le marché immobilier, et sont aujourd'hui devenues des standards de marché pour les grands immeubles de bureaux.

Le chapitre 3 soutient que cette rapide pénétration du marché peut être expliquée par deux facteurs clés intervenant lors de différentes phases du processus de diffusion. Lors des premières phases de la diffusion, les exigences des certifications ont été intégrées dans les systèmes de management environnemental des fournisseurs de surface, en premier lieu des promoteurs. Ceci a conduit à une montée très rapide de l'offre de surfaces certifiées. Dans un second temps, de grandes entreprises utilisatrices de locaux ont systématisé l'adoption de locaux certifiés, en l'intégrant dans leur politique RSE.

Pour les entreprises utilisatrices, les certifications sont un signal leur permettant d'identifier des immeubles aux performances plus durables. Elles offrent également une image de marque, associée à l'image durable qu'elles véhiculent. Le chapitre 4 suggère que les compagnies prenant à bail des locaux certifiés sont principalement motivées par des considérations de politiques et d'image. Dans ce cadre, l'image « durable » des certifications est essentielle pour assurer la satisfaction des entreprises occupantes. Cependant, alors que les certifications continuent à se diffuser et que les entreprises gagnent en retours d'expérience sur la performance environnementale effective des locaux certifiés, il est probable que l'image de marque ne suffise plus à assurer que les entreprises privilégient les locaux certifiés, en leur accordant une plus grande valeur (niveaux de loyers, attractivité locative).

## 3.4. Impact sur la valeur financière du stock de bâtiments existants (chapitre 5)

La diffusion d'immeubles neufs durables pourrait se traduire en un transfert de la demande des occupants (marché de l'espace) et des investisseurs (marché du bien) des bâtiments peu performants vers des bâtiments plus performants. Les préoccupations croissantes en faveur du développement durable correspondent ainsi à une nouvelle source d'obsolescence pour l'immobilier. Elles ont d'ores et déjà été intégrées comme un facteur de risque financier additionnel par les investisseurs. Pour contrer cette obsolescence, les investisseurs, parfois conseillés par des analystes tiers, ont recours à des mesures d'efficacité énergétique, et en particulier pour les espaces vacants aux travers de travaux de rénovation et de restructuration qui servent à améliorer la performance environnementale des portefeuilles. Le chapitre 5 suggère que les investisseurs immobiliers reconnaissent l'impact financier des performances environnementales et sociales, et qu'ils ont commencé à améliorer la performance de leurs portefeuilles en conséquence. Cependant, la grande

majorité d'entre eux continuent de se concentrer sur des actions ponctuelles dont les rendements sont immédiats, et négligent les tendances de plus long terme. Les améliorations des caractéristiques environnementales et sociales réalisées aujourd'hui pourraient ainsi se révéler insuffisantes dans le futur, et pourraient même être néfastes à des stratégies plus ambitieuses sur le long terme. Un modèle simplifié est proposé pour illustrer ces écueils, et tenter de passer de décisions ponctuelles répondant à des objectifs de court terme, à des stratégies de plus long terme reflétant l'intégralité des cycles de rénovations et de restructurations subis par un bâtiment.

# 4. Impact de l'argumentaire sur la "valeur de l'immobilier durable » sur les pratiques

## 4.1. Discussion théorique

L'idée qu'informer les acteurs de marché des bénéfices associés à la durabilité sera suffisant pour inciter des pratiques plus durables est très séduisante. Ce discours sur la valeur (ou « business case ») en faveur de comportements responsables offre une solution optimiste et à bas coût aux défis posés par le développement durable. Dans cette optique, les acteurs « informés » intégreraient volontairement les critères environnementaux et sociaux dans leurs pratiques afin de répondre à leur devoir fiduciaire. Ce discours permet ainsi aux entreprises et aux investisseurs de réduire les tensions existant entre objectifs de performance financière et préoccupations croissantes en faveur du développement durable. Il leur permet également de légitimer en interne les changements organisationnels nécessaires au développement de ces pratiques (Brammer *et al.,* 2012).

Cependant, divers auteurs ont émis des critiques sur ce raisonnement, en pointant notamment les contradictions entre le discours sur la valeur financière et une transformation en profondeur des modèles économiques. D'un point de vue pratique, Carroll et Shabana (2010) rappellent que le "business case" en faveur de la RSE est souvent réduit à une vision étroite des bénéfices liés à la durabilité, focalisée sur les économies immédiates plutôt que sur l'établissement de relations gagnantes-gagnantes avec les parties prenantes, qui seraient pourtant plus propices à générer du changement. En outre, ce raisonnement nécessite que les parties prenantes récompensent les investisseurs pour leurs pratiques plus durables. Or elles ne sont pas toujours disposées à le faire (voir Quairel-Lanoizelée, 2011), ce qui empêche le cercle vertueux décrit de se mettre en place.

Plus fondamentalement, Capron and Quairel-Lanoizelée (2015) expliquent que le « business case » en faveur de la RSE repose sur une vision « désencastrée » des relations entre les entreprises, la société et l'environnement. Il correspond à une perception des objectifs environnementaux et sociaux comme subordonnés aux conditions financières, plutôt que supports nécessaires aux activités économiques. En conséquence, il ne permet pas suffisamment de réaligner les priorités par rapport à ce que les objectifs de développement durable nécessiteraient.

## 4.2. Apport de la thèse

Les observations et résultats de cette thèse tendent à confirmer ces critiques, bien que quelques points positifs pour le futur soient cependant identifiés.

En ce qui concerne la valeur des bâtiments durables, le chapitre 1 montre que les bénéfices mis en avant en vue des choix d'investissement sont souvent restreints aux seuls gains financiers. Du fait des défaillances de marché, il est très peu probable que les bénéfices financiers estimés par les investisseurs reflètent l'intégralité des coûts et bénéfices pour la société, ce qui conduit à un sous-investissement dans des caractéristiques environnementales et sociales. Cependant, il est à noter que des tentatives d'évaluation des bénéfices plus larges voient le jour autour des concepts de valeur d'usage, de valeur économique totale et de valeur immatérielle.

En ce qui concerne la valeur pour les entreprises, le chapitre 2 met en avant le fait que le discours sur la « valeur verte », liée à la publication de diverses études hédonistes sur la valeur de marché des immeubles durables, n'est probablement pas un moteur clé du développement de pratiques plus durables au sein des sociétés foncières. La réglementation et les enjeux de légitimé prévalent. Le discours sur la « valeur verte » apparait plus comme un mantra, mis en avant a posteriori pour montrer les entreprises sur leur meilleur jour, argumenter les stratégies en interne, et peut-être aussi, faire en sorte que les parties prenantes de l'entreprise la récompense effectivement pour ses pratiques plus durables. Des changements organisationnels plus importants pourraient cependant voir le jour si les tentatives amorcées pour faire évoluer les relations avec les parties prenantes et mieux prendre en compte les gains non financiers portaient leurs fruits.

Dans ce contexte, les certifications environnementales existantes du bâtiment apparaissent à la fois comme un facteur de progrès et comme un frein, selon les chapitres 3 et 4. Indubitablement, leur rapide diffusion sur le marché des immeubles de bureaux de première main (neufs ou restructurés) a contribué à une meilleure prise en compte des critères environnementaux a minima durant la phase de conception/construction. En fournissant des étapes intermédiaires entre les diverses réglementations environnementales succesives, ils ont sans doute également permis la mise en place de réglementations plus ambitieuses. Cependant, ces systèmes restent encore tournés vers les pratiques de management environnemental au détriment de la performance environnementale effective durant la phase d'utilisation du bâtiment. Ils négligent encore un certain nombre d'enjeux sociaux et de gouvernance, pourtant importants pour les parties prenantes, et fournissent peu de garantie sur la valeur additionnel tant pour les investisseurs que pour leurs parties prenantes, notamment les occupants.

Enfin, le chapitre 5 suggère que le discours existant sur la valeur a sans doute contribué à l'approche de court terme de la gestion des immeubles existants. Analystes et investisseurs ont progressivement reconnus que la montée des préoccupations environnementales et sociales a un impact sur la valeur financière de leur bâtiment existant. Cependant, bien que cet impact s'étende dans la durée, les acteurs se concentrent principalement sur des actions ponctuelles et à court terme pour y répondre. Leurs actions sont ainsi guidées par une vision étroite du « business case » qui prend principalement en compte le contexte de marché actuel. Les bâtiments sont ainsi traités comme des actifs financiers, pour lesquels le rendement immédiat le plus important possible est recherché, et non comme des stocks qui nécessiteraient une gestion de plus long terme.

# 5. Limites de la thèse et futures pistes de recherche

## 5.1. Limites associées au périmètre des données empiriques

Cette thèse repose principalement sur des données et des observations issues du contexte français. Il pourrait être intéressant de développer une comparaison entre pays. Dans les différents chapitres, la comparaison des résultats avec les résultats d'autres travaux suggère que les mécanismes à l'œuvre sont très similaires entre marchés immobiliers mâtures. Cependant, des spécificités nationales pourraient exister liées notamment au cadre juridique et réglementaire. En outre, il existe peu de travaux publiés sur les marchés en développement.

## 5.2. Méthodologies opérationnelles d'intégration dans les choix d'investissement

Cette thèse examine différents projets, outils et initiatives pour l'intégration des informations environnementales et sociales sur les bâtiments dans les pratiques d'investissement. Cependant, elle n'a pas pour objectif de développer une nouvelle méthodologie. Des rapports d'organisations professionnelles comme celui de l'UNEP FI (2014) ont pointé le besoin de recherche approfondie à cet égard. Pendant la durée de ma thèse, j'ai eu l'occasion de participer à un projet du Sustainable Building Alliance (SBA) qui visait à faire des recommandations pour ces méthodologies d'information. D'autres pistes qui pourraient être explorées incluent notamment les opportunités offertes par la maquette numérique (Building Information Modelling en anglais). Ces méthodes ont été surtout étudiées sous l'angle de leur apport pour l'ingénierie des projets. Il pourrait également être intéressant de voir comment elles pourraient s'articuler avec les outils de gestion utilisés par les équipes financières.

## 5.3. Segmentation du marché et appariement de la demande

Le chapitre 5 évoque différents impacts possibles sur la montée des préoccupations environnementales et sociales pour la valeur des immeubles non performants sur le long terme. Cependant, la thèse ne les a pas tous discutés pleinement. Au fur et à mesure que les caractéristiques environnementales et sociales s'établissent comme standards de marché pour les nouveaux développements et les restructurations, deux principaux scénarii pourraient se produire. D'une part, l'arrivée d'une offre neuve d'immeubles performants d'un point de vue environnemental et social pourrait se traduire par un report de la demande des investisseurs (sur le marché des biens) et des occupants (sur le marché des surfaces) de vieux immeubles peu performants à des bâtiments plus récents et plus durables. Cette tendance conduirait à une diffusion des immeubles certifiés sur l'ensemble du marché. D'autre part, une segmentation du marché pourrait avoir lieu, entre des bâtiments neufs récents de haute qualité et des bâtiments plus anciens, moins chers et de moindre qualité de services.

La segmentation de marché correspond à une situation où il existe une hétérogénéité dans les fonctions de demande des acteurs, de manière à ce que la demande de marché puisse être désagrégée en différents segments aux fonctions de demande distinctes (Dickson et Ginter, 1987, p.4). En ce qui concerne l'immobilier durable, certains occupants (demande d'espace) peuvent préférer réduire leurs loyers à occuper des locaux plus durables. Les immeubles durables pourraient alors se retrouver cantonner à un marché des immeubles de haute qualité de service, puisque les investisseurs n'auraient aucune incitation à développer des immeubles durables dans le marché des immeubles de moindre qualité.

Des travaux de recherche approfondis seraient nécessaires pour étudier cette apparition possible d'une segmentation de marché. Cet axe de recherche serait particulièrement pertinent pour analyser les consentements-à-payer des locataires selon les caractéristiques environnementales et sociales de leurs locaux, ainsi que pour examiner l'importance de ces caractéristiques dans les négociations entre occupants et investisseurs pour la fixation du loyer et les reconductions des baux. A cet égard, la littérature sur la segmentation de marché en marketing, et les modèles d'appariement, couramment utilisés afin de représenter les négociations salariales en économie du travail représentent des pistes sans doute intéressantes à explorer.

## 5.4. Certifications de l'exploitation et nouvelles générations de labels

Pendant la durée de cette thèse, les certifications de la phase d'exploitation émergeaient tout juste sur le marché français. Les chapitres 3 et 4 se sont donc principalement concentrées sur les certifications de la phase de construction (et de rénovation), et n'ont pas considérés les labels liées à l'exploitation. Ce choix était d'autant plus justifié par le but des travaux : comprendre le rôle des certifications et des labels associés dans les choix de relocation des entreprises utilisatrices de bureaux. Les certifications à la construction sont généralement prévues en amont de la négociation entre investisseurs et occupants. Il est donc pertinent d'étudier ces labels comme un facteur dans la prise de décision. Cependant, les certifications de l'exploitation peuvent également être obtenues par les propriétaires, les occupants ou les exploitants techniques, alors que les occupants sont déjà en place. Les labels en question ne peuvent donc plus être analysés comme préexistants à la négociation. Des approches de recherche spécifiques doivent alors être utilisées pour examiner le rôle des labels à l'exploitation dans les relations entre les différents acteurs de marché, notamment dans les renégociations de baux.

En outre, analyser l'impact de la diffusion des labels à l'exploitation sur la valeur des locaux existants pourrait aussi être intéressant. Alors que les bâtiments avec une certification pour la phase de construction sont principalement en compétition avec les autres bâtiments neufs ou restructurés, les bâtiments avec des labels à l'exploitation sont en compétition directe avec les bâtiments existants. Le Canada pourrait offrir un terrain de recherche particulièrement intéressant pour cette analyse, le référentiel BOMA BESt® étant l'un des plus anciens systèmes pour les bâtiments existants.

De même, des nouvelles générations de certifications et de labels sont en cours de lancement. Ils ont notamment pour but de répondre aux critiques dirigées contre les certifications, en particulier en ce qui concerne leur capacité à garantir une valeur additionnelle aux occupants. En Amérique du Nord, le label WELL a ainsi été lancé en octobre 2014. Il vise à mieux refléter les préoccupations des

locataires, notamment sur les thématiques de santé, de confort et de satisfaction des occupants finaux (employés des entreprises utilisatrices des locaux). En France, une nouvelle version de la certification HQE a été annoncée le 26 mai 2015. Il serait intéressant de vérifier dans quelle mesure ces nouveaux référentiels répondent aux critiques et aux attentes exprimées.

# 6. Perspectives futures

La prise en compte des critères environnementaux et sociaux dans les pratiques immobilières est encore en pleine évolution. Le développement de nouveaux référentiels de certifications, le renforcement des réglementations, l'élaboration de nouveaux outils d'aide à la décision, la publication de guides et standards sectoriels… vont continuer à faire évoluer les pratiques. Des changements importants ont d'ores et déjà eu lieu. Je me demande cependant si ces changements seront à la hauteur des objectifs du développement durable. Dans les années à venir, le secteur devra sans doute subir des transformations plus profondes pour répondre à ces défis.

## 6.1. Changer de paradigme

Les changements qui ont lieu au cours des dernières années n'ont pas remis en question les fondements des organisationnels actuels. Les niveaux d'ambition des pratiques en matière d'immobilier durable est encore souvent assez discutable, et la prise en compte des thématiques environnementales et sociales restent encore largement subordonnés aux considérations financières. En ce qui concerne la RSE, Capron et Quairel-Lanoizelée (2015) critiquent cette vision désencastrée. Ils recommandent vivement une perception encastrée dans laquelle le système environnemental et social est le support des activités économiques. Ceci nécessiterait notamment que les acteurs de marché reconnaissent leur responsabilité à l'égard de la société et de l'environnement, qui rendent possibles leurs opérations. En immobilier, Hill et Lorenz (2011) appellent ainsi les professionnels du secteur à repenser leur rôle par rapport à la société. Du Plessis et Cole (2011) défendent un changement de paradigme pour pousser le changement. En pratique, ils recommandent la redéfinition du rôle des parties prenantes, ainsi que l'élaboration de nouveaux systèmes d'évaluation qui rendraient mieux compte de la nature holistiques de la performance environnementale et sociale des immeubles.

## 6.2. Nouer de nouvelles relations avec les parties prenantes

L'intégration de critères environnementaux et sociaux en immobilier n'influence pas seulement les investisseurs. Elle affecte également les autres parties prenantes, dont les intérêts doivent être mieux pris en compte pour contribuer au développement durable. Intégrer les parties prenantes dans les processus de décisions, en étendant leurs définitions à la collectivité et à l'environnement permettrait de faire un pas vers une transformation plus en profondeur du secteur (Du Plessis and

Cole, 2011). Ceci nécessiterait d'encourager le dialogue et d'élaborer des nouveaux modèles de collaboration. Intégrer les parties prenantes permettrait ainsi le développement d'outils d'évaluation mieux armés pour refléter la complexité de l'immobilier durable (Cole, 2005). Ceci permettrait par exemple de nourrir l'élaboration d'outils d'évaluation multi-échelles (bâtiment, quartier, développement urbain) et multi-parties prenantes, préconisés par Conte et Monno (2012) pour dépasser l'approche actuellement centrée sur les bâtiments des systèmes existants.

## 6.3. Redéfinir le concept d'actifs immobiliers

Ce changement de paradigme pourrait également nécessiter de repenser la vision de l'immobilier comme classe d'actif. Au cours des quarante dernières années, les investisseurs sont passés d'une gestion patrimoniale de l'immobilier à une approche financière dans laquelle l'immobilier est traité comme les autres classes d'actifs financiers, au travers de méthodes financières comme l'allocation optimale des portefeuilles (Nappi-Choulet, 2010). Cette « financialisation » du secteur est le contexte dans lequel les pratiques d'immobilier durable émergent (Boisnier, 2014). Une meilleure intégration des considérations environnementales et sociales questionne cette perception de l'immobilier comme simple actif financier.

L'immobilier n'est pas une classe d'actifs financiers comme les autres. En particulier, il a pour sous-jacent des bâtiments, avec des caractéristiques physiques spécifiques. Il évolue au cours du temps, et nécessite un flux constant d'investissement pour le maintenir en état (Bryson, 1997). En outre, des relations complexes existent entre l'immobilier, le développement urbain, nos modes de vie et de travail, ainsi que l'écosystème environnemental (Conte and Monno, 2012). Dans l'ensemble, Reed (2007) explique que l'immobilier présente des similarités avec les « systèmes complexes vivants ».

Analyser l'immobilier comme un métabolisme vivant pourrait permettre de mieux gérer les immeubles au cours du temps. Cette analogie entre le stock de bâtiments existants et le stock de bois en forêt, utilisée comme illustration simplifiée au chapitre 5, représente un premier pas dans cette direction. Cette analogie vise à mieux mettre en avant les caractéristiques de régénération des bâtiments (au travers des travaux de rénovation et de restructuration). Les recherches sur les métabolismes urbains (voir par exemple Salat et Bourdic, 2012) ouvre de larges voies pour explorer plus en profondeur cette analogie.

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